THURSDAY, OCTOBER 16, 1879

POLAR ICE

Die Metamorphosen des Polareises. Von Karl Weyprecht. (Wien, 1879: Moritz Perles.)

THIS book of Karl Weyprecht's is a most valuable outcome of the Austro-Hungarian Arctic expedition of 1872–1874, so well known already from the interesting general popular account of the doings of the expedition which has been published in most European languages. In the present work the author confines himself to an account of the phenomena presented by the ice amongst which he spent so many weary months. It might well be supposed that a book treating of such a subject only would be dull reading, but so graphic are Lieut. Weyprecht's descriptions, and so pleasantly are his long series of observations strung together into a continuous whole, that his book is most entertaining throughout, and the reader lays it down with a very much enhanced comprehension of the never-ceasing changes and mighty power of Arctic ice. Most of the facts recorded are known to Arctic explorers, and have been more or less set forth by them in their various writings, but no connected account of all the forms of the growth and death, of the movements and struggles of bergs and floes and ice of all forms has been before attempted Lieut. Weyprecht tells it us all from his own observations. The book is divided into a series of chapters headed as follows:—I. Various Forms of the Ice and their Origin. II. Ice-pressures. III. The Ice in Winter. IV. The Ice in Summer. V. The Changes of the Ice. VI. The Water Movement in the Polar Regions. VII. The Ice Movements. VIII. The Ice of the Arctic Interior.

In the first chapter he treats of the three different kinds of Polar ice: glacier ice, salt-water ice, and fresh-water ice. As an example of the mighty size of the Polar glaciers, the parents of the icebergs, he cites the Humboldt glacier of Smith Sound, which, pushing itself into the sea in Smith Sound, forms an unbroken ice coast-line composed of perpendicular cliffs 300 feet in height above the sea-level, and 60 miles in length, a single solid ice wall split only by vertical fissures. The fresh-water ice is clear as crystal, and so hard that the Norwegian walrus-hunters who run their small vessels in their voyages against all other ice obstacles, of whatever size, are careful not to charge even comparatively small pieces of this. This kind of ice is, however, scarce in the polar regions; it is the third kind of ice, that of salt water, or "field-ice," which forms by far the greater part of floating ice, and with which the book is mainly concerned. The *Tegetthoff* was shut in for a year in field-ice, and the author watched the incessant changes in the ice with great care throughout this period.

A simple smooth sheet of sea-water ice is no sooner formed than it begins to be subjected to a variety of influences, which speedily convert its smooth expanse into a complicated rugged surface, covered with ridges, valleys, and irregularities of all kinds, render its thickness everywhere unlike, and split it up with innumerable fissures. Most important amongst the causes of these changes are the variations of temperature to which the ice is exposed from the variation of that of the water below and the air above, and which are more or less local, and affect the ice differently wherever its thickness varies. From these differences of temperature ensue complicated strains in all directions, due to the unequal expansion and contraction of the mass, and the ice is rent by the tension; to these forces is added the pressure of surrounding ice-fields, driven by the action of winds or currents; long fissures are formed, the edges of which grind together with mighty force. After a while the edges separate, and the water between pulsates with the throbbing of the surrounding floes. Again they come together, and forced against one another with ever-increasing power, they are crushed and break up, huge blocks are piled above on the ice-surface, resting at all angles upon one another, and other huge blocks are forced under the ice below. Hence the ice becomes rugged above, and by the freezing to it of the blocks forced under water, equally so below, the variation in thickness is increased, and with it the amount of strains caused by variation of temperature. The drifting snow hangs against the ridges and pinnacles on the surface, and forms banks and mounds which not only increase the effects due to temperature by protecting the areas on which they lie from change, but also by their immense weight, combined with that of the projecting ice-masses by which they are formed, press down the ice which supports them, whilst the blocks below in other regions press it up. Throughout the mass gravity acts as a disturbant, no part being water-borne at its natural level, the mass is strained, and gives way in all directions, and fresh complications ensue.

All these changes are accompanied by a noise. The unlucky prisoner in the field-ice during the imposing unbroken loneliness of the long Arctic night, when the wind is calm, can hear the crackle of the snow under the stealthy tread of the Polar bear at an astonishing distance, and hear what a man, speaking loud, says at 1,000 metres distance. It can, therefore, be well understood how the sound of the ice-pressures must travel to his ear from enormous distances. "Sometimes," the author writes, "the noise of the ice movements was scarcely to be heard—a mere murmur—and came to our ears as does the play of the waves on a steep coast from the far far distance. Sometimes it hummed and roared closer to us, as if a whole column of heavily laden waggons were being drawn over the uneven ice surface." In the sound were combined all manner of noises caused by cracking, grinding, falling of blocks, crushing, and many other phenomena of ice-life. "It is astonishing how far and how clearly every noise is conducted in the ice. The noise at the very margin of the field on which we were seemed to occur immediately at our feet. . . . If we placed our ears to the ice the sound was heard so loudly that we might have expected the ice to open under our feet the next moment. The whole dry ice covering was as a vast sounding-board. Whenever, as I lay down to sleep, I placed my ear against the dry wooden ship's side, I heard a humming and buzzing which was nothing else but the sum of all the noises which occurred in the ice at great distance from the ship."

A curious fact is described by the author, that the surface of an expanse of young salt-water ice on which no snow has yet fallen is soft, so that the footstep is impressed upon its white covering as in melting snow. This is to be

observed even at a temperature of −40° C. The unfrozen fluid is not water, but a concentrated solution of salt thrown out by the freezing of the ice beneath.

When summer begins, the thawing that occurs is very local and unequal. Any dark body, such as a heap of ashes or the droppings of bears, eats its way into the snow, absorbing the rays of heat which are reflected off again by the general white surface. The bear droppings eat their way into the snow, and then into the ice, and the conical hole thus formed fills itself with water. It may, at last, eat its way right through the ice where not very thick. Thus are formed the greater part of those holes in drift-ice which are usually ascribed to seals. The author never saw a seal's hole in winter.

A number of interesting experiments were made on ice phenomena. For example, on March 5, a cube of ice was sunk under the ice-field to a depth of five metres. After a lapse of twenty-four hours it was found that a crust of new ice had formed itself over it about 1 cm. thick. This was caused by the low temperature of the block itself and, from a similar cause, ice-crystals had formed between the edges of the hole, owing to the coldness of its walls. On March 10 very little increase in the added layer of ice on the cube was to be observed. On March 20 this newly-formed ice was found to be softened so that it was easily impressed by the finger; by April 2 it had become harder again, though porous and apparently a little increased. From thence onwards the block dwindled regularly, especially on that part of its surface which was turned upwards; on July 18 it was only a third of its original size; nevertheless, the hole through which it was sunk had, during the last period, become entirely closed by young ice at its lower margin. This experiment shows the loss of ice from below by the action of the warmth of the water. The author concludes from his experiments and measurements that compact salt-water ice can never attain a greater thickness than 10 metres.

Icebergs are subjected to disintegration after somewhat the same manner as rocks so commonly are. They are full of crevasses, into which the water formed by melting penetrates; in winter this water freezes, and by its expansion all through the glacier a rupture of the mass ensues. "It is highly probable that most of the icebergs afloat in winter are in such a condition that a very slight cause is sufficient to make them burst because of their state of internal tension. . . . Every polar traveller can tell how a shot, the driving-in of an ice-anchor, or any other sudden vibration, has brought about the catastrophe; cases have even occurred in which the sound of the voice alone was sufficient. An iceberg is always an unpleasant neighbour." So many are the causes which tend to destroy icebergs that the author concludes "no berg exists which could withstand them more than ten years, and that commonly the life of a berg is much shorter." However this may be, doubtless the much larger Antarctic bergs last very much longer, as must necessarily occur because of the much greater uniformity of the climate to which they are exposed.

With regard to glaciers, the author quotes an interesting observation of Kane's to the effect that even in lat. 78° 20′ during the entire winter, however low be the temperature, the glacier streams never dry up. The melting which supplies them with water can only derive its requisite heat from the friction of the ice-masses.

The chapter on the ice-movements is full of interest. Every field acted on by winds and currents has its own peculiar velocity, depending on the dimensions of the irregularities above and those of the resistances below, in which no two fields are alike. From these differences of velocity arise the irresistible pressures between contiguous fields. The iceberg deeply sunk drifts but slowly, whilst the ice field may travel very fast. If the field catches up a berg in its course, it is broken and torn by the berg; and as it proceeds on its course its broken fragments are piled up block upon block on the coast of the iceberg. To a casual observer it appears as if the iceberg, driven by a counter current below, were being forced in the opposite direction to the ice-field, so as to plough it up. Many groundless accounts of the existence of such counter currents thus observed have been circulated.

Another cause of pressure between ice-fields is that, owing to the irregularities on their surfaces, they are twisted round by the action of the wind, which takes hold more on some regions than others. Every field is differently thus acted upon for each direction of the wind. A similar effect is caused by the currents beneath acting upon the irregularities of the under surface. So various are the movements in the ice-fields, that even when the ice lies all the while closed, it is very seldom that any two pieces remain for any length of time in the same position alongside one another. Two ships beset together by the ice are sure sooner or later to be separated.

The author fully admits that the danger incurred by explorers in the Antarctic regions is very much greater than that to which Arctic voyagers are exposed. The fog in the south is a terrible enemy, and there a ship cannot at once take refuge in the field-ice as in the north. He urges, however, the necessity for scientific Antarctic exploration and observation, and suggests that a wintering in the lands lying south of Cape Horn could be easily accomplished, and would not require any very extensive appliances. We fully agree as to the benefit to be derived by science from a round of meteorological observations and all other kinds of scientific exploration in the Antarctic regions, and heartily wish that such enterprise would take the place of the constant struggles to get to the North Pole. By the mere reaching of the pole there is nothing to be attained. A steamship could very possibly run down from New Zealand direct to Mount Erebus and Terror in a fortnight during the summer months; such an attempt has never been made. It need not be very costly, and possibly the Government of one of the Australian colonies may make it some day. We commend Karl Weyprecht's book to all who study ice phenomena, but not only to specialists, for it is full of interest to all intelligent readers. H. N. MOSELEY

THE SILK GOODS OF AMERICA

The Silk Goods of America. By Wm. C. Wyckoff. (New York: Van Nostrand.)

THIS book has been issued under the auspices of the Silk Association of America, with the view of affording information as to the character of the silk goods manufactured in that country. Not many years since

nearly all such goods were imported, and even now the entire product of many of the American silk mills is represented to the consumer as of European make. The Silk Association have, however, bestirred themselves; they find that in order to obtain a standing in a market where imported articles hold an established reputation they are obliged to make better fabrics than their foreign rivals, and, naturally enough, they now seek to secure for themselves the credit of their enterprise. The Centennial Exhibition startled the manufacturers both of this country and of France with the extent and rapidity of their progress in developing this special branch of industry. The railways across the Continent and the direct trade with Asia across the Pacific Ocean have placed America more nearly on a level with European countries as regards supplies of raw silk; improvements in the power-loom and the continuance of the tariff policy of the Government have done the rest. Mr. Wyckoff boldly states that had that policy vacillated during the last ten or fifteen years there would have been no story of improvement to tell.

One of the main difficulties with which the American manufacturer had to contend was the want of skilled labour, and this was more especially felt in the production of black dress goods. On account of the necessity of securing perfect equality in the threads, such goods are far more difficult to produce than are more highly ornamented fabrics, but although the manufacture of broad black silks on anything like a large scale has only been attempted in America during the last half-dozen years it is estimated that fully a third of the plain silks and a much larger proportion of the brocade silks which are consumed in that country are made there. Indeed Mr. Wyckoff states that the advance in this branch of manufacture within the last three years is greater than that in any other department of American silk industry. Nor is the reason for this far to seek. The American manufacturers, as a class, have studiously set their faces against the abominable system of "loading" which prevails so largely on this side the Atlantic. Nearly all European broad black silks are doubled, nay, sometimes even trebled, in weight in the dyeing of the yarn. This is how the "Black Art" is practised in France. The yarn is repeatedly dipped in nitrate of iron until sufficiently weighted, after which it is passed through a bath of prussiate of potash and then treated with gambier and acetate of iron. To brighten it it is next passed through a logwood bath and well soaped; if it is to be soft and satin-like it is oiled and treated with soda; if it is to be stiff and rustling it is dipped in acid. No wonder after this that the black silk with its load of grease and iron wears shiny, and cracks in the folds. "It is asking too much to demand that the few strands shall act as iron-mine, soap-factory, and chemical laboratory all at once and stand the wear of practical use besides. These are requirements before which the English attempt to make a grocery store out of a shirt pattern is a simple and ordinary matter." Nothing is easier, however, than to discover this loading of dye-stuff. If ladies would insist on being allowed to test a small sample of the silk, at home, before purchasing, by the very simple operation of burning it, the sophistication would speedily perish. Pure silk crisps instantly on burning, and leaves a small quantity of charcoal; loaded silk smoulders slowly to a yellow ash. Not many years ago men's coats were largely trimmed with black silk braid; but now, as a maker in the article was heard dolefully to declare, "the trade in black braids is as dead as Julius Cæsar," for we have naturally got disgusted with the frayed and brown appearance which the article generally assumes after a week or two's wear, thanks to the fact that it usually contains more dye-stuff than silk. The public is gradually awakening to a knowledge of these things, just as surely as the patient Hindoo and the heathen Chinee have had their eyes opened to that miserable compound of starch, cotton, China clay, and Epsom salts which the Manchester merchants have palmed off upon them as genuine shirtings.

Let the silk manufacturers take warning: to meet falling markets with inferior goods dressed and dodged so as to simulate a better article is simply to hasten on the time of trouble and disaster. Markets have reputations as tender as that of Cæsar's wife. If such malpractices continue we shall soon be clamouring, in the interests of commercial morality and of national prosperity, for an extension of the Adulteration Act from our Food to our Clothes.

DARWINISM AND OTHER ESSAYS

Darwinism and other Essays. By John Fiske, M.A., LL.B., formerly Lecturer on Philosophy, Instructor in History, and Assistant-Librarian at Harvard University. (London: Macmillan and Co., 1879.)

TO readers of NATURE there is nothing new and little very striking in these essays, and it is only justice to Mr. Fiske to remark that the title of the first, which gives its name to the volume, claims nothing of the sort. The most interesting consideration in the four papers upon the subject is the marvellous way in which every science and line of thought, both in natural history and in human history, have entirely changed their aspect and started in a new direction since the publication of "The Origin of Species." One fourth of the book is a review of Mr. Buckle's "History of Civilisation," written and published by Mr. Fiske when he was nineteen years old: the object of reprinting which now it is hard to see. Yet it is interesting read in immediate juxtaposition with the chapters on Darwinism, for nothing could show so distinctly how high and dry the stream of knowledge has left the whole theory of a work most celebrated only twenty years ago. Buckle's book, the theorem of which was that there is a science of history, the laws of which are as uniform and invariable as those of mechanics or astronomy, if only we could discover and measure all the various forces at work, was an energetic effort in the right direction, and was gladly welcomed by many scientific men of the day. But the key to the puzzle had not then been found. Had Buckle lived in these days, when the works of Darwin, Herbert Spencer, and Sir H. Maine are familiar, he would, no doubt, have built up a far more coherent theory than he did.

In two other papers in this volume we find development working in two very different spheres, viz., in the production of a nation, in the account of "The Races of the Danube," and in the production of a catalogue, in his description of a "Librarian's Work." Had Mr. Fiske

carried out the former more in the spirit of Buckle and Darwin, it would have added greatly to the interest of the paper and to the coherency of the book. There is also a fairly contemptuous article on "Psychic" force and its manifestations, as described by those who believe in it. His "Crumb for the Symposium" is certainly a dry one; his arguments throw no light on a very dark subject; but he draws an agreeable contrast between ten disputants on the subject of a future life meeting in the sixteenth century, and adjourning to some ecclesiastical court preparatory to a final settlement at Smithfield, with their now forming a symposium for a fair discussion in *The Nineteenth Century*.

Scattered through the book are many eloquent passages of scientific teaching. There is a striking description (p. 18) of the changes the surface of the earth has undergone, which might have prompted Byron's lines on the changelessness of the ocean. One cannot but expect good teaching from a man who lays down the excellent rules and takes the high standard of both learning and teaching truth which Mr. Fiske does, in his affectionate notice of Mr. Chauncey Wright, an eminent specimen of a class of men who, though little thought of and almost unknown individually, are yet the "good belly" which absorbs and distributes all the fresh acquisitions of more active and enterprising "members" of society. And the most valuable habit of mind in such persons is the kind of scepticism recommended by Mr. Buckle, though Mr. Fiske hardly seems to comprehend the feeling, which consists in distrusting received opinions as final; not in refusing to hold any opinions at all, but in being ready to doubt as soon as any good reason is offered. A theory, like a fire, is a very good servant but a very bad master, and true scepticism consists in willingness to give up a theory as soon as facts are brought out with which it is inconsistent. Mr. Fiske praises this high quality in Darwin (p. 34), but in other passages in his book it would appear that he urged a spirit of doubting old axioms only. He seems to think it right to put full faith in a newly-formed opinion, and to "repose" upon it (p. 175). One would have thought that the severe criticisms in his larger work, on Comte's premature conclusions, would have led him to be less confident in scientific "truths," and it is curious to see the spirit that ruled Mr. Chauncey Wright praised by a man who has confidently laid down a cosmic philosophy. Still the harm is not in airing cosmic theories—there are many valuable advantages in doing that—but in clinging to them, as human weakness is only too apt to do when they are no longer consistent with latest observations.

OUR BOOK SHELF

A Ministry of Health, and other Addresses. By B. W. Richardson, M.D., F.R.S. (London: Chatto and Windus, 1879.)

THIS is a collection of addresses given by Dr. Richardson, mostly in his capacity of propagandist of sound ideas as to individual and especially national health. In the lecture which gives the title to the volume he advocates the national urgency for a responsible minister of health, not so much to obtain new sanitary laws as to enforce the multitude of existing laws on the subject, which, from the want of any central authority, are at present a dead letter. Dr. Richardson's arguments are forcible, and must be convincing to any unprejudiced mind, and we trust that ere long his recommendations will be given practical effect to. The second paper is a sympathetic and extremely interesting sketch of the life and work of William Harvey, the model physician, teacher, and public man of his time. The other lectures are: "A Homily Clerico-Medical," "Learning and Health" (in which some valuable hints as to educational methods are given), "Vitality, Individual and National," "The World of Physic," "Burial, Embalming, and Cremation," "Registration of Disease," "Ether-Drinking, and Extra-Alcoholic Intoxication."

Frozen Asia: a Sketch of Modern Siberia. By C. H. Eden. (London: S.P.C.K.)

MR. EDEN has collected in this neat little volume a good deal of valuable information concerning Siberia. The information, however, is somewhat fragmentary in its nature, and not well digested in parts, long quotations from books and journals and daily papers being indulged in. Mr. Eden, in his account of recent explorations, confines himself to a few voyages (mainly Nordenskjöld's) along the coast, ignoring all that has been done in the interior. He, we regret to see, makes use of that most vicious and misleading term, "Turanian," and actually talks of certain quite unrelated peoples as belonging to a mythical "Turanian Stock." The sooner the word is banished from ethnological terminology, the better for the progress of the science. The book, so far as it goes, contains much trustworthy information.

Jack's Education; or, How he Learnt Farming. By Prof. H. Tanner, F.C.S. (London: Chapman and Hall, 1879.)

PROF. TANNER has put together, in the form of a really readable story, a series of papers for the purpose of showing the manner in which the science classes and the Government Department of Art enable a youth to prepare himself for the Government Scholarships, and by a tolerably complete course of science instruction qualify him for learning any industrial occupation with a thoroughly intelligent mind. The instruction in science given in colleges is reviewed from the standpoint of practical requirement, and with special regard to such a course of study being rendered most valuable as a preparation for learning any commercial industry. The story is both instructive and interesting, and we recommend it to all interested in "technical" education.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Greenwich Meteorological Observations

THE notice of the recently published "Reduction of Greenwich Meteorological Observations," NATURE, vol. xx. p. 525, contains remarks which seem to show misconception in regard to some points of the work. On these the Astronomer-Royal has requested me to offer suitable explanation.

Some criticisms, p. 526, on the table of mean air-temperatures deduced from eye-observations (Table 125), terminate with the remark that the mean temperatures for Greenwich "remain still to be calculated." But it appears to be overlooked that a complete table of standard mean temperatures, daily and monthly, deduced from the photographic records for the twenty years, 1849 to 1868 (from twenty-four readings on each day), is to be found on p. 49 (Table 77). In forming the daily means, values for the few days on which no photographic value was available were derived from the eye-observations; the results thus completely represent the period 1849-1868, and will form

our standard of reference for air temperature until a further reduction of the photographs shall enable us to extend the period and so further improve them. The mean temperature of Greenwich, according to Table 77, is 49°·72.

The mean temperatures of Table 52 are also deduced from the photographs, without correction for omitted days; they serve to show the climatic variations in different years: if desired, the effect of the omitted days could be readily determined. Here the mean temperature comes out 49°·69.

The table of mean air-temperatures for the period 1847-1873, deduced from eye-observations (Table 125), to which particular attention is drawn, p. 526, is naturally of secondary importance, and really owes its introduction into the volume partly to accident. It was thought desirable in preparing for press the deductions from the photographic records, to add, in the same volume, but in a separate section, a collection of results of the observations of the earth-thermometers for the period 1847-1873, and a table showing the mean air-temperature during the same period seemed a proper accompaniment to these results. Now the photographs had been discussed only for the period 1849-1868, and, as there were already existing mean temperatures for the longer period, 1847-73, deduced from eye observations (by use of Mr. Glaisher's corrections), these temperatures were taken for comparison with the earth-thermometer results. The expression "accurate mean temperatures" (last line of extract, p. 526) was never intended to indicate that Table 125 should supersede Tables 52 and 77, but simply to explain that the air temperatures were *mean* temperatures as distinguished from the *noon* temperatures of the remaining tables of the section. Further it is indicated in a sentence not quoted, but forming portion of the paragraph from which the extract already referred to is taken, that the eye observation series was adopted for this section because photographic results were not available for the whole period. It may be here explained that employment, for reduction of the eye-observations, of the corrections for diurnal range, &c., given by the photographic records, produces values in harmony with the photographic values, and corrections so derived are now used in the reduction of eye-observations for immediate use. But Table 125, as it stood, fulfilled the object for which it was inserted, that object being rather to exhibit *variations* of temperature. No argument founded on the absolute temperatures shown by the earth-thermometers has much significance, because we are unable to test their index errors. In fact, the true value of the whole collection of tables in the earth-temperature section consists, not on their exact indication of absolute temperature, but on the information which they afford in regard to comparative changes of temperature, the retardation of temperature, and generally the propagation downwards of surface-waves of temperature.

In the last paragraph of the notice attention is directed to what is called the "somewhat rough method" adopted in reducing the barometric observations to 32°. This erroneous idea may have, perhaps, been encouraged by the circumstance that in the Introduction no mention appears to have been made of the fact that the temperature of the underground apartment in which the photographic barometer is placed is almost uniform. Considering this in connection with the construction of the apparatus, in which (as fully explained in the Introduction) the register depends on the height of the mercury in the lower tube of a syphon barometer, and is influenced by the expansion of some four inches only of the mercurial column, it will be understood that the effect of temperature (change of temperature) in a period of twenty-four hours (the extent of one sheet) is not perceptible.

In the third and fourth lines of the paragraph, on p. 526, commencing "From this table," it would seem that the word "excess" should be "defect."

WILLIAM ELLIS

Royal Observatory, Greenwich, October 7

Saturn's Dusky Ring

I WRITE to call the attention of observers to the present appearance of the inner dusky ring of Saturn. Although the ring is not very open, only permitting that portion near the ends to be seen on the nights of the 9th and 11th of this month, using a portion of a large reflector sufficient only to show Enceladus clearly, it was most prominent, and not to be overlooked. It had the appearance of being covered with bright points, such as a rough dusk paper touched lightly with chalk would give; that part in front of the ball being dark, and showing as a fine dark line across, equal in width and shade to the shadow beneath, so that the narrow part of the whole ring appeared on the face of the planet as if bounded by two fine parallel dark lines. The wide and the narrow division at the ends of the ring were very plain.

Not having seen this dusky ring before, I can only go by the published accounts, but it is so much brighter than they would lead one to suppose that it is very difficult to believe that it is not changing very rapidly. The observation of one to whom the ring is familiar would settle this point.

A. A. COMMON

Ealing, October 13

Suicide of the Scorpion

DOUBTS having been expressed at various times, even by learned naturalists, as to the reality of the suicide or self-destruction of the scorpion by means of its own poison, and these doubts having been again stated in NATURE, vol. xx. p. 553, by Mr. R. F. Hutchinson, of Peshawar, as the result of his own observations, I think it may be useful to give an articulate account of the phenomenon as it has been related to me by an eye-witness, which removes all possible doubt as to its occurrence in certain circumstances.

While residing many years ago during the summer months at the baths of Lucca, in Italy, in a somewhat damp locality, my informant, together with the rest of the family, was much annoyed by the frequent intrusion of small black scorpions into the house, and their being secreted among the bedclothes, in shoes, and in other articles of dress. It thus became necessary to be constantly on the watch for these troublesome creatures, and to take means for their removal and destruction. Having been informed by the natives of the place that the scorpion would destroy itself if exposed to a sudden light, my informant and her friends soon became adepts in catching the scorpions and disposing of them in the manner suggested. This consisted in confining the animal under an inverted drinking-glass or tumbler, below which a card was inserted when the capture was made, and then, waiting till dark, suddenly bringing the light of a candle near to the glass in which the animal was confined. No sooner was this done than the scorpion invariably showed signs of great excitement, running round and round the interior of the tumbler with reckless velocity for a number of times. This state having lasted for a minute or more, the animal suddenly became quiet, and turning its tail or the hinder part of its body over its back, brought its recurved sting down upon the middle of the head, and piercing it forcibly, in a few seconds became quite motionless, and, in fact, quite dead. This observation was repeated very frequently; in truth, it was adopted as the best plan of getting rid of the animals, and the young people were in the habit of handling the scorpions with impunity immediately after they were so killed, and of preserving many of them as curiosities.

In this narrative the following circumstances are worthy of attention:—(1) the effect of light in producing the excitement amounting to despair which causes the animal to commit self-destruction; (2) the suddenness of the operation of the poison, which is probably inserted by the puncture of the head into the upper cerebral ganglion; and (3) the completeness of the fatal symptoms at once induced.

I am aware that the phenomena now described have been observed by others, and they appear to have been familiarly known to the inhabitants of the district in which the animals are found. Sufficient confirmation of the facts is also to be found in the narratives of G. Biddie and "M. L." contained in NATURE, vol. xi. pp. 29, 47, and it will be observed that the circumstances leading the animal to self-destruction in these instances were somewhat similar to those narrated by my informant. It is abundantly clear, therefore, that the view taken by Mr. Hutchinson, viz., that the "popular idea regarding scorpionic suicide is a delusion based on an impossibility" is wholly untenable; and indeed, the recurved direction of the sting, which he refers to as creating the impossibility of the animal destroying itself, actually facilitates the operation of inflicting the wound. I suppose Mr. Hutchinson, arguing from the analogy of bees or wasps, imagined that the sting would be bent forwards upon the body, whereas the wound of the scorpion is invariably inflicted by a recurvation of the tail over the back of the animal.

ALLEN THOMSON

London, October 11

Climatic Effects of the Present Eccentricity

I ASK for an explanation of the following difficulty:—

Dr. Croll says, in his "Climate and Time" (p. 65), that "the

temperature of a place, other things being equal, is proportional to the heat received from the sun."

His reviewer in the *Quarterly* for July last says: "The mean January temperature of England may be taken at 39° F., which is equivalent to 278° F. of absolute temperature" (meaning, above the temperature of space taken at −239° F.), "and if we calculate what would be the mean temperature of the same month when the sun was distant 97,500,000 instead of 91,000,000 of miles as it is now, we find it comes out 242° F., which is equivalent to 3° F. of our thermometer, or 29° of frost."

If we use the same method to find to what extent the present value of the eccentricity ought, even now, to affect temperatures on the earth's surface, we arrive at a result apparently so contrary to experience that I think "there must be a mistake somewhere." I ask your readers to tell me where.

Let S be the temperature of space. Choose two places in equal north and south latitude; and let U, U' be their July temperatures respectively, A, A', their January temperatures, *i.e.*, at aphelion and perihelion; e the eccentricity. Then we have, according to the principle used by Mr. Croll and his reviewer—

$$\frac{S+A'}{S+U}=\left(\frac{1+e}{1-e}\right)^2.$$

With the present value of the eccentricity, viz., 0·0168, this gives—

$$A'=0{\cdot}0695\,S+1{\cdot}0695\,U,$$

giving to S the usually accepted value, −239° F.

$$A'=16{\cdot}61+1{\cdot}0695\,U.$$

$$\therefore A'-U=16{\cdot}61+0{\cdot}0695\,U \quad . \quad . \quad . \quad (1)$$

That is to say, the January temperature of the place in south latitude, ought to exceed the July temperature of the place in equal north latitude by more than 17° F.

In like manner we find the relation between U' and A to be—

$$U'-A=-15{\cdot}53-0{\cdot}07\,A \quad . \quad . \quad . \quad (2)$$

That is to say, the July temperature of the place in south latitude ought to be more than 16° lower than the January temperature of the place in north latitude.

Now it may be replied that geographical and meteorological causes may completely mask these differences. The mean June temperature of the northern hemisphere is known to be higher, instead of lower, than the mean December temperature of the southern hemisphere, and it is considered that this is sufficiently accounted for by the excess of land there. If this explanation be true, the effect of the excess of land must be capable of increasing the mean temperature not only by the number of degrees by which the northern hemisphere exceeds the southern, but by this amount *plus* 17° F.

Subtracting (2) from (1)—

$$(A'-U')-(U-A)=32{\cdot}14+0{\cdot}07\,A+0{\cdot}069\,U.$$

This shows that, so long as A' is greater than U' and U greater than A, this difference is greater than 32°. That is, the difference between the excess of summer temperature over winter in the southern hemisphere exceeds the like excess in the same latitude north by more than 32°. Is there any indication of an excess of annual variation in anything like this extent in the southern hemisphere?

But observe the result at the equator. If the latitudes of the two places are continually diminished they will eventually be found both of them on the equator; in which case A' and A become identical, and likewise U' and U. Now the right-hand side of the equation being positive, the left-hand side must be so too. Hence $-(U-A)$, which was negative, in becoming $A'-U'$, which is positive, must pass through zero. This shows that one effect of the eccentricity is that it is not under the equator that the January and July temperatures are the same, but under some latitude north of the equator.

When the two places are both on the equator, or rather when only one place upon the equator is considered,

$$A-U=16{\cdot}07+0{\cdot}03\,(A+U) \text{ (nearly)}.$$

If we put for $\frac{1}{2}(A+U)$ the mean temperature of the equator, or 80° F., this equation gives $A-U=21°$ F. nearly.

That is to say, the January temperature of a place on the equator ought at the present time to be about 21° F. higher than the July temperature, if the temperature of space is so low as −239° F.

The temperatures themselves would be—

$$A=90°\tfrac{1}{2},\ U=69°\tfrac{1}{2}.$$

I would ask, therefore, whether there is any indication of so great a difference as the above at any station on or close to the equator.

If $A-U$ is not so great as 21° F., it must be owing to causes which diminish A or increase U. The place being on the equator, would not be reached by the north-east trade-winds; moreover, in July their extension towards the equator would be least. Consequently, they would have little effect to increase U by bringing warmth from the heated continents. In a similar way the south-east trades would be at their weakest in January, and have their least effect to diminish A by bringing cold air and water from the Southern Ocean. Meteorological causes would, therefore, seem to tend rather to exaggerate than to mask the difference in question, if the observations were taken in an insular position near the equator.

I believe there is admitted to be some uncertainty about the value used for the temperature of space. Herschel's investigation in his meteorology may not be thought satisfactory. But it is remarkable that Pouillet, following quite a different method, arrived at almost the same result. At any rate the temperature which the earth would assume, were the sun extinguished, must be very low. But is it so low as −239° F.? If it were, it appears that, if the principle used be correct, those results would follow which I have suggested; and I ask whether any observations bear upon the question? It is obvious that it touches Dr. Croll's celebrated theory somewhat closely. O. FISHER

Harlton, Cambridge, October 4

Does Sargassum Vegetate in the Open Sea?

HAVING had many opportunities of observing patches of "living Sargassum in the open sea" from the deck of H.M.S. *Challenger* during her cruise in the North Atlantic in the early part of the year 1873, I venture to offer a few remarks in reply to the above inquiry of your correspondent in NATURE, vol. xx. p. 552. The track of our ship between Madeira, the Canary Islands, St. Thomas in the West Indies, Bermudas, and the Azores is almost equivalent, as a glance at the map will show, to a complete circumnavigation of the central part of the North Atlantic generally known as the Sargasso Sea. During this cruise *Sargassum bacciferum* was met with frequently so as to render the appearance of this seaweed a sight quite familiar to all on board the *Challenger*. It was first seen on March 2 in about lat. 22° 30′ N., long. 42° W., halfway between the Canaries and the West Indies. Again on March 6, lat. 21° N., long. 49° W., quantities of gulf-weed drifted past the ship. On more than one occasion large patches of Sargassum were observed extending from the vicinity of the vessel to a great distance. The gulf-weed was also encountered between St. Thomas and the Bermudas group, and was last met by us between the latter islands and the Azores on June 18, lat. 35° N., long. 53° W.

As regards the exact form and appearance of this interesting alga, I cannot do better than quote from the graphic description given by Sir C. Wyville Thomson in the pages of "The Atlantic," vol. ii. pp. 9, 10:—

"They (the patches) consist of a single layer of feathery bunches of the weed (*Sargassum bacciferum*), not matted but floating nearly free of one another, only sufficiently entangled for the mass to keep together. Each tuft has a central brown thread-like branching stem studded with round air-vesicles on short stalks, most of those near the centre dead, and coated with a beautiful netted white polyzoon. After a time vesicles so encrusted break off, and where there is much gulf-weed the sea is studded with these little separate white balls. A short way from the centre, towards the ends of the branches, the serrated willow-like leaves of the plant begin; at first brown and rigid, but becoming farther on in the branch paler, more delicate, and more active in their vitality. The young fresh leaves and air-vesicles are usually ornamented with the stalked vases of a *Campanularia*. The general colour of the mass of weed is thus olive in all its shades, but the golden olive of the young and growing branches greatly predominates. The general effect of a number of such fields and patches of weed, in abrupt and yet most harmonious contrast with the lanes of intense indigo which separate them, is very pleasing."[1] On p. 339 of the same volume we find the following remark:—"Very few of the higher algæ live even occasionally on the surface of the sea; the notable exception is the gulf-weed

[1] "The Atlantic," by Sir C. Wyville Thomson. (London: Macmillan and Co., 1877.)

(*Sargassum bacciferum*), which scatters its feathery islets over vast areas of warm, still water; and affords rest and shelter to the peculiar nomadic fauna to which I have already alluded (vol. i. p. 186, &c.)."

My colleague on board the *Challenger*, Mr. H. N. Mosseley, on p. 567 of his recently-published "Notes by a Naturalist,"[1] refers to the pelagic habits of Sargassum and other sea-weeds in the following words:—

"Besides these smaller algæ (*Trichodesmium*) living in the open ocean, there are abundance of several species of larger sea-weeds which are pelagic in habit. The Gulf-weed, *Sargassum bacciferum*, of the Sargasso Sea in the Atlantic, is well known. It is brown when dried or preserved, but when living is of a very bright yellow colour, which contrasts pleasingly with the deep blue of the open Atlantic. Another sea-weed (*Fucus vesiculosus*) is to be found also living free in the Atlantic, and the Giant Kelp (*Macrocystis pirifera*), in the floating condition, ranges over a wide belt of the Southern Ocean, as proved by Sir Joseph Hooker ('Flora Antarctica,' vol. i., pp. 464-465).

"All these sea-weeds grow attached to rocks on various shores as well as free, but they all produce spores, only when attached. The pelagic varieties multiply only by simple growth and subdivision. A wide area covered with sea-weeds corresponding to the Sargasso Sea occurs in the North Pacific Ocean."

In refutation of one of the fanciful reports alluded to by your correspondent, namely, that some branches of the floating Sargassum rise two inches above water, and are thus driven along by the wind, I may add that the bunches of the Gulf-weed float at, but not upon, the sea-surface, being almost completely immersed in the water, and often entirely so. At times, when a patch of weed is seen crowning the top of a wave, the tips of the feathery bundles protrude above the water, without, however, presenting a surface large enough for the wind to act upon. Probably, owing to the action of surface-currents, an apparently endless procession of patches, large and small, may be often observed drifting past the ship, forming in the aggregate long yellow streaks or bands, which cover the sea as far as the eye can reach.

J. J. WILD

[1] "Notes by a Naturalist on the *Challenger*," by H. N. Moseley, M.A., F.R.S. (London: Macmillan and Co., 1879.)

The Temple of Nodens in Lydney Park

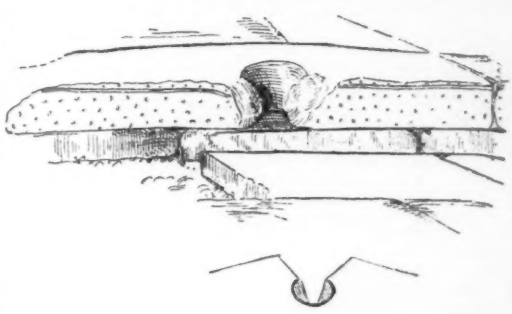
PROF. RHŶS' interesting review on Mr. King's volume in NATURE, vol. xx. p. 285, has been recalled to mind by the notice of the same quarto in Saturday's *Athenæum* (September 27); and I would remind those interested of the occurrence of a somewhat analogous relic of ancient rites in the pavement of the primæval fane on the island of Gozo; which relic was first (I believe) noticed by myself in the pages of the *Athenæum* in November, 1872. A fuller account, with diagrams of the pavement, appeared subsequently in the *Journal* of the Anthropological Institute, vol. iv. (Plate vi.) in a paper on the "Non-historic Stone Relics of the Mediterranean."

Prof. Rhŷs writes: "We have not yet done with the pavement, for in the part occupied by the dedicatory inscription, but not quite in the centre, seemingly not to cut up the names, as Mr. King thinks, there is what he describes as 'a circular opening, nine inches in diameter, surrounded by a broad red band again inclosed in two others of blue.' That some high mystery was involved in the setting of this unsightly object in so conspicuous a position, cannot admit of any doubt." He comes to the conclusion that this funnel was meant to receive libations poured to the god, and that they were drunk up by the dry soil beneath. He further compares this opening in the pavement "to the well of salt water, that famous memorial of the former presence of Poseidon in the Acropolis of Athens."

Compare this with my account of the Gozo pavement in 1872, as follows:—

"In the pavement of the inner left-hand pair of chambers at Gozo, to the right are the partially-covered remains of a large stone basin, or hollowed stone with a broad raised brim, and in the threshold of the entrance, between the two chambers, a broken holed stone, at the base of which was some coarse burnt clay, hollowed so that the stone could hold water. At Hagiar Khem these holed stones or stone rings are frequent, and may have been used for holding the pins on which the valves of heavy doors turned, or, more probably, may have served to support earthenware *amphoræ* or *cadi*, with pointed bases, as was commonly the practice amongst not only the ancient Egyptians, but also the Greeks and Romans.

"The most unaccountable feature, however, in the whole of the monuments is to be found in the central stone of the platform of the centre apse at Gozo, right opposite to the entrance of the left-hand pair of chambers. This consists in a curious *funnel-shaped*



concavity, with one side cut away to the edge of the step of the platform of which it forms part. It is sharply cut, and in tolerable preservation, and seems designed as a species of socket in which some portable pillar, pole, altar, or vase could be fitted and fixed, or unshipped and replaced, on separate occasions. The reader may suggest some more practical use for which it may have been intended."

Accordingly, I would now adopt Mr. King's suggestion that, like the terra-cotta funnel fitted into the similar orifice at Lydney, it was meant to receive the drink-offerings of blood or libations of wine poured to the "god of the deeps." Anyhow, this would add effect to the surmise that a primæval fane of huge stones (very doubtfully *Druidical!* may I suggest *Phœnician?*) had been converted into a Roman temple for the benefit of the Latin-speaking iron-workers, "*prope Sabrinum ostium*." The *Athenæum* reviewer reminds Mr. King that there is no *classical* authority that connects Druidism directly or indirectly with any stone temple or megalithic remains, adding, however: "*The dolmens of Wales are probably posterior to the withdrawal of the Romans.*" What authority can he claim for this except Mr. Fergusson's Arthurian myths from the Welsh triads in Herbert's "Cyclops Christianus." I should be glad if Prof. Rhŷs would deal with this question, and ask if he can reconcile the following theories of Fergusson in his "Rude Stone Monuments":—

1. The post-Roman dolmen-builders came "from the south, first touched in Cornwall, and thence spread northwards, settling on both sides of St. George's Channel, and leaving traces of their existence on the south and both coasts of Ireland, as well as in Wales and the west of England generally" (see p. 274).

2. The Siluri and Brigantes emigrated from Spain to the banks of the Severn 261 years before our era (p. 381).

3. "We find the Bryts beginning to use stones after having been driven from the fertile plains of the east into the fastnesses of Cumberland and Wales; so we find the Spaniards first adopting rude stone monuments after having been driven into Portugal and the Asturias" (p. 380).

4. Locqmariaker and the monuments of the River Boyne were all erected in the first four centuries after Christ (p. 370).

5. The Crozon and Carnac monuments ascribed to the Arthurian age, 380–550 A.D. (p. 375).

6. The dolmen of Confolens: "It is a dolmen pure and simple, and it was erected in the twelfth century" (p. 336).

The Phœnicians, who dealt with the tin-workers of Cornwall, must have been amongst the first navigators who explored the banks of the Severn and recognised the mineral treasures of the Forest of Dean.

S. P. OLIVER

P.S.—Since writing the above I notice that M. Carapanos and M. Foucart found certain lead plates from the ruins of Taracovista (the ancient Dodona), on which petitions similar to that of Silulanus are inscribed; for instance, one Agis consults the great Zeus on the subject of his pillows and blankets, which he has lost or had stolen from him; whilst another, a shepherd promises his gratitude to Zeus if he succeeds in rearing his sheep, &c. These tablets and bronzes found with them were exhibited at Paris last year. The great Dodonian Zeus therefore

may have been the prototype of the Silurian *Nodons*. What is the orthography of Lydney? S. P. O.

October 5

Do Bacteria or their Germs exist in the Organs of Living Healthy Animals?

In the August number of the *Journal für praktische Chemie*, Messrs. Nencki and Giacosa assert that bacteria and their germs exist in the organs of healthy living animals, in contradiction of Messrs. Chiene and Ewart, who took the negative side of this question in the *Journal of Anatomy and Physiology* for April, 1878. I give the chief parts and points of Nencki and Giacosa's refutation.

"Dr. Burdon Saunderson repeated Tiegel's experiments. The organ just taken from a newly-killed animal was immediately plunged into paraffin heated to 110°. As soon as the mass cooled the surface was covered with Venetian turpentine, so as to protect the specimen from infection from without by the cracking of the paraffin. Burdon Saunderson announces that when two days after, the organ at the bottom of the vessel was taken out, it was in a clotted and rather cooked condition on the outside in consequence of the heat. But the centre contained numbers of bacteria in the various stages of their existence. . . . The last-named authors (Chiene and Ewart) worked upon the conclusion that in the time between extracting the organ and plunging it into the paraffin, bacteria germs from the air fall upon it, thus causing the subsequent decomposition. This was to be guarded against by an antiseptic method. Their procedure, therefore, was as follows:—Under a continuous spray of a solution of carbolic acid, a newly killed rabbit's abdomen was opened, and the liver, spleen, kidneys, and pancreas extracted. The liver was cut into several pieces; some pieces were wrapped in gauze, soaked in a solution of carbolic acid. Others were wrapped in unprepared gauze; while others were put into jars which were raised to a great heat, and then closed up with wool, gauze, or glass covers. The same was done with the other organs. After three days, the specimens were examined, and no bacteria were found in those which had been wrapped in antiseptic gauze. . . . Messrs. Chiene and Ewart therefore conclude that if the organs are treated antiseptically after death, no bacteria or germs of them will be found; and that hence no germs of bacteria exist in the living, healthy organs. . . ." Messrs. Nencki and Giacosa thus describe an experiment which they made, in order to prove the contrary. There was a vessel containing mercury; a large glass test-tube, filled with mercury, closed with a slip of glass, and inverted in the vessel. The latter was then heated till the tube was one-third filled with mercury vapour, which must have destroyed any bacteria which could by any possibility have remained in it. The vessel was allowed to cool; the quicksilver in the tube condensed again; and when the mercury in the outer jar was at 120°, it was covered with a 5 per cent. solution of carbolic acid." Some internal organ (liver, heart, kidneys, or spleen) was then taken from a rabbit that had just been killed, and with a pair of tweezers was brought under the mouth of the tube, up which it ascended when let go. The apparatus was then kept at a temperature of 40° for several days. The results of all experiments conducted in this way were favourable to the admission that bacteria exist in the organs of living healthy animals. Already in twenty-four hours all the organs, when examined, gave out an intensely foul odour, and showed countless split fungi in different forms. . . . The beginning of putrefaction is shown by the pressing down of the mercury in the tube by the generation of gases. . . . All the vessels and instruments we employed were lifted out, immediately before use, from a carbolic acid solution. . . . Why, then, did putrefaction not set in in Messrs. Chiene and Ewart's experiments? That neither a spray of, nor transient immersion in, carbolic acid will kill the germs in the tissues, is proved by our experiment, in which the organ is passed through the solution into the mercury and up the tube. But it is a different thing when the organ is for a long time in contact with material (the antiseptic gauze) previously soaked in the solution of carbolic acid." This, Nencki and Giacosa prove by experiment. And it seems to be natural that while a brief immersion in the antiseptic solution must be amply sufficient to destroy any bacteria which might have lodged upon the organ in its transit through the atmosphere, prolonged contact with the solution must cause the inmost parts of the specimen to be permeated by the destroying poison, thus rendering the results of the subsequent examination null and void in their bearing on the question. In conclusion, Messrs. Nencki and Giacosa maintain that pathologists must accept the fact that the germs of bacteria exist in the organs of living healthy animals, and advise them to consider this in their studies of infectious diseases, as the existence of ordinary decomposition bacteria in the tissues indicates that it may be different forms of them which are the causes of various contagious maladies. E. Burke, jun.

Subject-Indexes to Transactions of Learned Bodies

Mr. Garnett, in his paper printed in Nature, vol. xx. p. 554, proposes to make the Index to Scientific Periodicals by cutting up two copies of the Royal Society's Catalogue and using this as the "copy" for the Index; but the thought has struck me that if the "copy" of the Royal Society's Catalogue is still in existence there is the material ready to hand for commencing work at once. I believe the Index might be done this way by any one who had access to the chief periodicals; but the title of a paper is often so very deceptive that without frequent reference to the papers themselves I am afraid we should get even worse mistakes than the one mentioned by Mr. Garnett. Now that the last volume of the Catalogue is out it is sincerely to be hoped that the Council of the Royal Society will take this "Subject-Index" into consideration. Jas. B. Bailey

October 10

Change of Colour in Frogs

It is certainly a common opinion in this part of the country that when frogs become of a bright yellow colour fine weather may be expected. The brightness of colour can scarcely be due to the presence of sunlight, for frogs of a bright yellow may frequently be found in cellars, wells, and other dark places. Throughout the past summer and up to the present time, I have noticed that the frogs in this neighbourhood have been of an extraordinarily brilliant yellow tint. Again and again have I heard the country people, working in the hay or corn fields, under the unbroken canopy of cloud, remark—"We must be going to have fine weather now, for look at the colour of the frogs." These forecasts proved the reverse of successful.

W. Clement Ley

Ashby Parva, Lutterworth, October 10

At the commencement of "the rains" (say, beginning of June), in the island of Bombay, after the first showers, when a little water lodges in the depressions of the old-quarry tanks, the frogs issue from the crevices of the trap-rock to spawn, when the *males* (some of which are 18 inches in length from tip of toe to end of digit) assume a bright mustard-yellow colour, while the females remain brown as usual; and this change of colour takes place so rapidly, and the frogs are so numerous, that, with the falling of the showers, the bottom of the quarry becomes suddenly yellow. I never saw a frog so coloured at any other time, and I witnessed the fact above mentioned for at least two successive seasons in the same old quarry. H. J. Carter

Devon, October 13

Intellect in Brutes

The case of the Norwegian dog, Nero, mentioned by Mr. Horsfall in Nature, vol. xx. p. 505, is certainly an admirable example of abstract reasoning. Here the dog thought as any man would have thought how, where, and when to catch the railway train suited to his purpose. It has reminded me that, when I was in Malta a few years ago, a fine Newfoundland dog (if I remember correctly) used to accompany Miss Hallett in her ride from Sliema to Valetta on a visit to her grandfather in Strada Forni. The ride is about four miles round the head of the harbour. On one occasion she observed that the dog had ceased to follow her, and concluded that, owing to the heat or some other cause, it had returned home. Her surprise was considerable on arriving in Strada Forni, for there she found the dog waiting for her at her grandfather's door. The explanation is, as was subsequently discovered by a frequent repetition of the same thoughtful dodge: the dog had gone to the ferry, waited there until passengers stepped into the boat, got in himself, was ferried across the harbour, and in this way was saved a long and, it may be, a hot and a dusty run. So far as I can remember, the animal had no previous experience of this short

mode of transit between Sliema and Valetta, except that he had *observed* people performing the journey by that route.

One of your correspondents some time ago gave as an instance of sagacity the case of a monkey returning to him a nut for the obvious purpose of having it cracked. It recalled to me that, several years since, I gave a nut to a monkey in the Zoological Gardens, London, whereupon the said monkey, having put the nut into his mouth and moved his jaws about with a sort of theatrical effect indicative of the hardness of the shell, returned it to me, as any child might have done under similar circumstances, with the evident object of getting me to crack it. I declined, and, at the same time, I gave back the nut. The monkey descended to the ground, laid the nut down, picked up a stone, and at once cracked it for himself, showing an intelligent idea of resources, that as my teeth were not available as a substitute for his, he could utilise a stone for a hammer.

CHAS. POPHAM MILES

Château de St. Léger, Darnétal, Seine Inférieure, October 7

Butterfly Swarms

INCLOSED is a specimen of butterfly which, about the middle of December, 1878, flew past my bungalow in crowds, all making for north-west, and going down-hill. In about four weeks afterwards, that is, well into January, 1879, the same butterfly began to return, this time flying to south-east, and up-hill. Starting from the bungalow, I rode four miles to north-west, and went about 1,000 feet down-hill, and found the butterflies still ascending. They came from beyond a hill about 300 feet higher than the bungalow, and they went back over the same range.

On both occasions the temperature stood at about 80° F. in the shade, the winds moderate and variable, and as often against as in favour of the flight, which, on its going and coming, lasted for two to three days both ways.

On the return journey I found the butterflies settled in "swarms" on damp, sandy spots near ravines, and so thickly settled that with one sweep of a circular butterfly net fifteen inches in diameter I caught about 150. M. B.

Hill Country of Ceylon, 3,000 feet above Sea-level, September 14

[The butterfly is one of the *Pieridæ*, and in all probability is identical with *Appias albina*, Boisduval. The habit of settling in swarms on damp spots is common to many butterflies, and even to several of the few species that occur in Britain.—ED.]

The Hunting Spider

THIS arachnid is very common out here, a very tiger amongst insects, and very interesting to watch. Its poison must be intensely virulent. If two are placed together under a finger bowl, and one happens to be the smaller, a very little manœuvring soon brings him within the instantaneously fatal grip of the larger animal; but if of equal size, a most interesting series of watchful movements and counter movements commences, each anxious to secure the first and fatal bite. Leap after leap is parried, advance of one is accompanied by a wide awake backward retreat of the other, and so on for a long time. When *the* fatal spring is made, the victim is at once *hors de combat*, and the conqueror carries it off rejoicingly. I once gave a spider a blue-bottle fly, and then learned for the first time that these insects were viviparous, for the fly in its death throes protruded a heap of active little maggots which soon died from want of a proper nidus in which to develop. On another occasion I found a hunting spider on a looking glass, and as from its movements it was evidently after game, I drew near quietly to watch. To my surprise and amusement I found that the spider was *stalking its own reflection*, and its cautious movements on tip toe, looking downwards, opened up to me a wide field of thought. What feeling was at work in that small breast? Was it the natural instinct after prey, or the burnings of jealousy in the apparent presence of a rival, or pleasure in scrutinising its own charms, now for the first time exhibited to it? If the latter, then the hunting spider is, I fancy, the lowest animal in the scale, which has been deceived or flattered by a looking glass.

Dogs, monkeys, and cats, are easily imposed on by a glass, and, as the first thing a monkey does on seeing a mirror, is to pass its hand round to the other monkey, you can soon originate a fight by grasping the hand behind the glass; and then hastily dropping it, watch the amazement of Jacko at the sudden and mysterious disappearance of his rival.

Peshawar H. F. HUTCHINSON

GEOGRAPHICAL NOTES

ON Saturday evening the Berlin Geographical Society, presided over by Dr. Nachtigal, celebrated the birthday anniversary of Carl Ritter, the famous German geographer—a ceremony which had been postponed from August. Ritter himself founded this society in 1828, and presided over it till 1860. "Those days," said Dr. Nachtigal, in opening the proceedings, "on which their intellectual princes are presented to the nations are landmarks of their life and development, and to honour them is a duty of honour." The University, the Army, and the other kindred societies throughout Germany, were all largely represented, and handsome subscriptions were announced for a memorial to the hero of the evening.

AMONGST the resolutions passed at the Brussels International Congress for Commercial Geography we point out the following:—1. The Congress is of opinion that, in the interest of all nations it is desirable that one or more lines of railway should connect the coasts of Afric with its interior. 2. Complete freedom of trade should reign there. 3. In the expectation of a complete abolition of custom-houses, it is desirable that as many commercial treaties as possible should be concluded. It is particularly necessary that a treaty of this kind should be preliminarily entered into between Belgium and Holland. 4. The Congress expresses the wish that everywhere instruction in history should be separate from that in geography. The Congress expressed some further wishes which related to an expedition for discovering the shortest route from Mandalay to Mekong; the speedy execution of the Panama Canal project, the rendering safe of the commercial routes leading to Inner Africa, the furtherance of free trade, the amelioration of the system of representation of countries by consuls, the commercial route from Tong King to the south-west of China, the introduction of the same meridian for all countries, the construction of railways on the Balkan peninsula and in Asia Minor, the introduction of a uniform system of measures, weights, and moneys for all civilised peoples, the abolition of slavery in countries where it continues to be officially countenanced. Next year's congress will take place at Lisbon.

AN International Geographical Congress will be held at Nancy in August, 1880.

THE International Congress of Americanists was opened at Brussels on September 23. The King of the Belgians and many persons of rank were present.

THE boundary between British Guiana and Venezuela is a very vexed question, and in consequence of Mr. Boddam-Whetham having included in his recent work some notes on it from a Venezuelan source, Mr. E. F. im Thurn, a well-known authority on matters relating to British Guiana, has gone carefully into the matter. He has just embodied the results of his investigations in a little *brochure*, which contains a good deal of geographical information. Mr. im Thurn regards the following as the best settlement of the question. The mouth of the Morooca should be taken as the northernmost point of our colony, and from there to the old Dutch post on the Cuyani, the boundary should be as in Cordazzi's map. Thence it should be carried to the nearest point of the Mazaruni, and then up the course of that river to the junction of the River Cako, and along the latter river to Mt. Roraima. From that central and well-marked point, southward to the source of the Corentyne, and then northward along the course of the river, it should follow the line laid down in Sir R. Schomburgk's map.

THE special service officers, whose departure for South Africa was alluded to in NATURE, vol. xx. p. 64, have evidently done good work from a geographical point of view, for in his despatch, written from Ulundi on September 3, Sir Garnet Wolseley, in reporting the conclusion of the war, states that he has been able to extend our topographical knowledge of Zululand, and by actual survey, as well as by reconnaissances, to lay down on paper with very tolerable accuracy its rivers, mountains, &c.

THE St. Petersburg correspondent of the *Daily News* telegraphs that after the departure for England of the seven steamers which failed to get through the Kara Sea, the steamship *Louisa*, with a Russian charter, succeeded in finding a passage, and arrived at Yeniseisk, discharged her cargo, and loaded 20,000 poods of wheat for Europe. The *Golos* recommends the establishment of a meteorological station at the extremity of the Island of Waigatz, between the two gulfs, to be connected by telegraph with the other parts of the Empire and Europe.

ACCORDING to the *Colonies and India*, Mr. Alex. Forrest, in his journey across North-west Australia, from De Grey River to Beagle Bay, found large tracts of rich land along nearly the whole coast and within easy reach of the sea. From Beagle Bay he went to the western shore of King's Sound, and after passing up the Fitzroy River, returned along the eastern boundary of West Australia. He reports well-watered and grass country near Beagle Bay, though it is rather densely wooded with the cajeput, red and white gum, &c. No rivers of any size were discovered, and the country was almost entirely level. As regards natural productions, Mr. Forrest reports the pearl-shell beds to be unlimited in extent. The soil is generally a sandy loam; in some parts there are a few ironstone hills, and in others limestone is found, but nowhere are there any indications of gold.

MR. ORVILLE A. DERBY, Director of Geology in the National Museum of Brazil, we learn from *Science News*, was at last accounts about starting on an exploring expedition in the interior of the empire. He goes in company with a party of engineers who are to make surveys for a railroad route. The chief of this party is Mr. Roberts, an American. They will first ascend the river São Francisco to the Falls, which are 168 miles from the sea. They carry with them a steam launch, by means of which they expect to navigate the river above the Falls. Mr. Derby expects to leave the engineers after their work is finished, and to cross the province of Minas Geraes, celebrated for its product of gold, and he will make the geology of that region a special study. The distance to be gone over is not less than 600 or 700 miles, and will probably be much more in the detours of travel. A very hasty geological survey was made of the country in 1866 by J. A. Allen, the ornithologist, O. H. St. John, geologist, and Thomas Ward; they were then members of the famous Agassiz expedition. They began in the upper waters of the river and worked downward toward the Falls. The late Prof. Hartt explored below the Falls, to the mouth of the river. The work undertaken by Mr. Derby is in an important and very extensive field, about which very little is definitely known.

THE American expedition, gone out in search of the remains of Sir John Franklin, which landed at the northern shore of Hudson's Bay, in the vicinity of Depots Land, on August 9, 1878, continued its journey to King Williams Land in sledges, on April 1, 1879.

THE German geographers, Drs. Greef and Gasser, have arrived at Lisbon on their way to Africa. A scientific task has been confided to them, and they will begin their labours with the study of the zoology of the West African Islands.

NEWS just arrived from Pekin states that the Hungarian traveller, Count Szechenyi and his companions have started on the journey to Tibet, under protection of Chinese officials, and with an escort of thirty soldiers. They intend to visit Sining, Shen-Chung-Chia, and Tsaidam, and then to proceed on the great northern Kukunor road to H'Lassa, which is situated some 700 miles beyond Tsaidam.

EARLY in the present year the Rev. C. R. Fairey made a most remarkable missionary journey, travelling alone for some 300 miles along the dangerous north and east coasts of Tasmania. The journey was entirely performed in a canoe 12 feet long, 28 inches beam, and 12 inches in depth. Mr. Fairey now proposes to make a voyage on the Murrumbidgee and Murray Rivers in Australia.

AFTER the pattern of European Alpine Clubs a Himalaya Club is stated to have been formed in India with a view of attempting to ascend the highest peaks of that gigantic mountain chain.

UNDER the title of "La Cimbébasie" *Les Missions Catholiques* publishes some interesting geographical notes on a tract of country in Western Africa, extending on the seaboard from the mouth of the River Cunene to that of the Orange River. On the north the boundary of this region, which has lately been constituted a separate ecclesiastical district by the Holy See, marches with that of the Portuguese colony of Angola in the direction of the Mano Mountains, and then follows the right banks of the Casai and the Lotenbua as far as Lake Dilolo. On the east it runs along the Liba to the point where the Chobé (the Cuando of Major Serpa Pinto) falls into the Zambesi, and finally follows the eastern frontier of the Bechuanas from Lake Makarikari to the Rivers Vaal and Orange. In this region are included Damara-land on the north-west, Namaqua-land on the south, the tribes of the Kalahari Desert on the east, and on the north Ovampo-land, &c. These notes, which are drawn up by Père Charles Duparquet and are illustrated by a map, are the more worthy of attention, as the greater part of this large tract of country has recently been placed under the British Protectorate.

SIR GEORGE ELLIOT, M.P. for North Durham, has signified his intention to dedicate a piece of land on his estate, West Cliff, Whitby, to the public, and erect thereon a monument to Capt. Cook, who spent several years of his early life at the fishing village of Staithes, a few miles to the north of the port of Whitby. In later years he sailed from the harbour of Whitby, and it is an historical fact that in undertaking his adventurous voyages round the world he preferred the vessels which were built at Whitby by Whitby men.

MESSRS. SAMPSON LOW AND CO. are to publish Dr. Holub's Narrative of his important explorations in South Africa. They have also in the press Signor D'Albertis' Narrative of his Explorations in New Guinea; it will contain many illustrations in ethnography and natural history.

THE last *Zeitschrift* of the Berlin Geographical Society contains detailed narratives by Dr. Hildebrandt of his important journey from Mombassa to Kitur, and by Dr. Hirschfeld of a journey he made in South-West Asia Minor. The *Verhandlungen* contains a valuable description of the Galapagos Islands, by Dr. Theodor Wolf, and a series of measurements of elevations in Ecuador, by the same, both from the Spanish of W. Reiss.

FROM the American Geographical Society we have received the annual address of the president, Dr. C. P. Daly, being an elaborate and valuable paper on the Early History of Cartography, or, "Maps and Map-Making before the time of Mercator." The paper is profusely illustrated with specimens of old maps, and must have involved a great amount of research. The last *Bulletin* of the Society (No. 5 of 1878) contains a long account of a journey along the west coast of South America, from

Panama to Valparaiso, by Mr. James Douglas, and an account of a visit to the "Wonderful Rivers of Cambodia," by Mr. Frank Vincent.

DR. CREVAUX, the explorer of French Guiana, is not yet, it seems, coming home, but will attempt to reach the Andes by the Içа or Putumayo, exploring that water-system as he has already done the Marori, Ozapok, Yary, and Para.

OUR ASTRONOMICAL COLUMN

BIELA'S COMET.—Even if the earth should encounter an unusual number of meteors on arriving at the descending-node of Biela's comet next month, as some have anticipated, the display is likely to be masked to a considerable extent by overpowering moonlight. The earth will reach the node (so far as we can judge of its actual position) on November 27, and the moon will be full on the following day. Remembering that the meteors of 1872 were not generally remarkable for brightness, though there were some notable exceptions, should there be a return of the shower, a large proportion may escape notice. No doubt, however, a strict watch will be maintained during the last week in November. We are not able to judge how near we may be to the meteoric mass which the earth met on November 27, 1872; it would arrive at perihelion at the end of December in that year, but we do not know the exact period in which it was revolving.

It is worthy of note that the effect of the differences of mean anomalies and mean motions when the two nuclei of the comet were last observed in 1852, would in 1879 occasion a difference in the times of perihelion passage to the extent of nearly 3½ days, and the mutual distance of the nuclei would be increased to 0·075 of the earth's mean distance from the sun, or nearly 7,000,000 miles.

Between the year 1772, when the comet was first observed, and 1852, when the last observations were obtained, the node had retrograded upwards of 11°, the perturbation being chiefly caused by the planet Jupiter in 1794, 1831, and 1842.

When we consider the conditions under which Biela's comet appeared in 1805, we are struck with the favourable opportunity which the repetition of such a case may afford for a precise determination of the solar parallax. On the evening of December 8 in that year the comet at transit at Greenwich was distant from the earth less than 0·038, and its horizontal parallax was upwards of *four minutes;* at this time, with a declination of near 24° south, it was rapidly descending below the horizon in Europe, still it was well observable, and of course would have been in a very good position for observation at the Cape of Good Hope. Its appearance also was favourable for accurate observations, which is more than can be said of all comets that have approached near to the earth. Olbers mentions that on this evening when he was observing with Bessel, the nucleus was very small and defined like a planet, and Gauss at the same time compares it to a star of the third or fourth magnitude. There has been no such opportunity since the Cape Observatory was established.

THE GALLERIES OF THE CUTTING ANTS OF TEXAS

MR. McCOOK, the devoted student of insects, has in preparation a memoir, which will be looked for with the intensest interest, resulting from his prolonged investigations into the life-history of the cutting or "parasol" ants of Texas (*Atta fervens*), bidding fair to rival his work upon the agricultural ants.

First, let us take with Mr. McCook a brief view of a denuded surface on a high grassy prairie, covered with a number of small moundlets of fresh earth-pellets, yet without a sign of life, and looking entirely abandoned; over its surface were seen little heaps of dry twigs and pieces of leaves. But towards evening, hosts of ants hurried out, and formed two long double columns to the top of an overhanging live-oak. The ants in the descending columns all carried above their heads portions of green leaves, whence they derive their popular name of "parasol" ants. The closing of the gates in the morning came to pass thus:—Bits of dry twigs and leaves of various lengths are carried into the gallery, filling it up from half an inch to an inch and a half below the surface; often the galleries slant inwards, even to 45°; or divide soon. The larger "castes" carry in the refuse; as the hole closes the smaller castes appear. The "minims," in small squads, fill in all interstices with minute grains of sand, and finally the last steals in behind some bit of leaf, and the establishment is closed. The reverse takes place, when outside work is resumed in the evening. When the larger forms get out they at first carry away and drop their burdens, and little seems to be accomplished for a long time. But in a marvellous way there occurs a final rush, by which the gate is opened. The bigger pieces of twigs are evidently regarded as special treasures, and were seen used on several successive days. The use of the smallest castes is thus found; some remain at only one-sixteenth of an inch long, while the fertile female attains nearly an inch, and the male is three-fourths of an inch long. The interior of the formicary is composed of caverns or pockets communicating with the surface and with each other by tubular galleries. The chambers contained masses of very delicate leaf-paper wrought into rude combs. Some masses were hemispheres in shape, others were arranged in columns two and a half inches high, in contact, along the floor of the chambers, whose dimensions might be nearly three feet by one foot, and eight inches high. Some hung from tree-roots which passed through the chamber. All this material was composed of the fibre of leaves reduced to this form within the nest. In each portion of ant-comb the cells were nearly hexagonal, but very varied in size, some being half an inch in diameter, but most of them as minute as one-eighth of an inch. Large circular openings ran into the heart of the mass. Ants of the small castes were very numerous in these cells. The material of the comb was very fragile and perishable. It is supposed by Mr. McCook that the ants feed upon the juices of the leaves, but this waits further confirmation. Some of these chambers are even of very large dimensions; one of the size of a flour-barrel was seen, being the main cavity of a formicary, in which were found very many winged males and females and larvæ. This was situated 669 feet from a tree that stood in the front yard of a house, which these ants had stripped. Mr. McCook took a plan of the underground way traversed by the ants to reach this point; the course varied very little from a straight line; two branches had been made to a peach orchard 120 feet distant. Only the small forms appear to take part in the digging, while the larger assist in opening the gates, make the excursions, and do the leaf cutting. The least forms, or minims, assist in opening and closing doors, and taking charge of larvæ. The minims are quite ferocious in attack, and gallantly support the large-headed soldiers. The process of leaf-cutting has been so successfully observed by Mr. McCook, that it is quite deserving of further notice, which we hope soon to give.

G. T. BETTANY

ROUTES TO CHINA *viâ* ASAM

THE possibility of connecting India with China by a tolerably direct and easy trade route overland is a question of increasing interest to us all, in India and England. Not only would such a route benefit the large valley of Asam, by causing an influx of labour more or

less useful for the growth and manufacture of tea, and convert it from a *cul-de-sac* into a great highway. But the spectacle would be removed of two large and populous empires touching each other, and in harmony, yet having no direct intercourse.

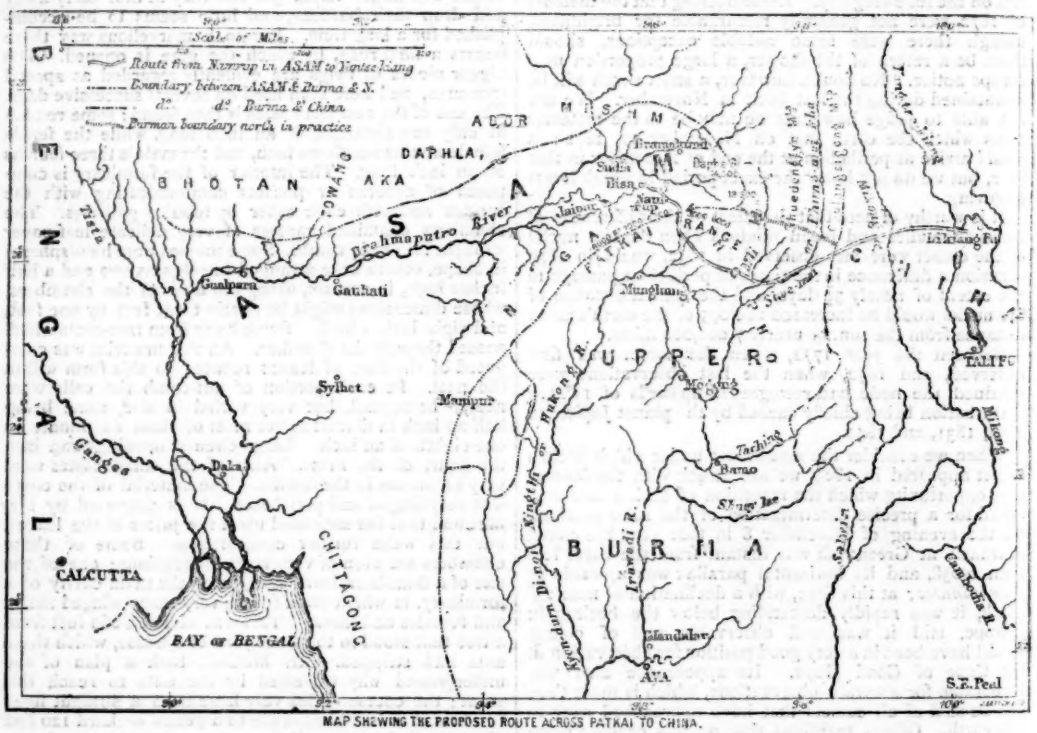
In past times this subject received careful attention from those who were in a position to judge of the relative values of the various routes, and whether *vid* Kamaun, Nipal, Sikim, Bhutan, or the Mishmi Hills the elevations were found to range from 10,000 to 18,000 feet, often at several points on each line, and there has been an almost unanimous agreement that the route from Asam *vid* Patkai and Hukong Valley presents the least difficulty.

Pemberton, in his report on the north-eastern frontier in 1835, after a survey of Munipúr, Passage through the Naga Hills and knowledge of the Bhutan frontier, unhesitatingly reports it as the best route "presenting no serious obstacles."

The late General Francis Jenkins (Governor-General's agent in Asam from 1834 to 1868) was well acquainted with the various routes, and says:—"By this pass is—to the best of my information—the only practicable line throughout the encircling mountain ranges from Asam and India into Burmese territory, and thence to China."

Lieut. Charlton also, who had experience on this question, says (*Journal A.S.B.*, 1835):—"What a pity there is no means of communication between Sadia and Yunan, a good land road, and there are no natural obstacles of any consequence to prevent it, would afford an outlet for British merchandise into the very heart of China."

In 1868 and also in 1869 Mr. H. L. Jenkins crossed Patkai near the site of the old route, and demonstrated that the only obstacles of any note were of a political, and not a physical nature (*Proceedings, A.S. Bengal*, July, 1870, p. 230). In January last, 1879, the Chief Commissioner of Asam kindly permitted me to cross the Patkai and ascer-



MAP SHEWING THE PROPOSED ROUTE ACROSS PATKAI TO CHINA.

tain relative and actual elevations, and briefly I may say that the extreme altitude of the track where I crossed the range is 3,445 feet above the sea, and 2,734 feet above the level of the Asam valley, the descent on the Burma side being about 1,000 or 1,200 feet only, the passage from the river levels of one side to the other being always done in one day, or one and a half if herds of cattle are taken; but it is noteworthy that the range is much lower at a short distance to the east, where it is easily seen that passes exist at 2,000 feet or less, where the old track is reputed to have been, by which the Ahoms and the Burmese army entered. The whole range is covered by a dense tree jungle, and any one acquainted with the sturdy hillmen who use this track will understand that the present route is selected simply because it presents an easy passage. The trouble of climbing a few hundred feet more or less is of little consequence to these hardy mountaineers. It is also near some villages where provisions are procurable, the country east being absolutely uninhabited.

After crossing Patkai I descended to the Nongyang Lake, a sheet of water about 1,800 by 1,000 yards, lying in an open flat grassy valley, about 10 miles long by 2 or 3 broad. As I had taken a *Rob Roy* canoe with me, I was able to get out on the lake and had a good view of the range; the lake and valley level stands from 1,500 to 2,000 feet above that of Asam. On returning, my party crossed from the Nongyang Lake on the Burmese side to the river Nunki on the Asam side, in about seven hours of actual travel.

Hitherto the great obstacle to any route this way was thought to be difficulty of crossing Patkai; it was considered an impassable barrier, even by those in favour of a joint route from Asam and Upper Burma. But it is now clear that this barrier does not exist, and that an

easy and low route is possible. Thus the first step in a good and easy trade route out of India is secured, and secured here alone.

From Nongyang the usual route for traders is *vid* Namyung, Songphú village in a level plain of same name, thence *vid* the Turong villages and rolling slopes of the upper part of the Dinoi valley and the low Kako hills dividing it from the Irawadi. On crossing this latter two routes are available, one up the Shoemai Kha and Sittang flat country, the other more east, turning the southern extremity of the Goulang si gong range, that coming down from the north divides Burma from China. Such a route would also pass round the heads of the Taeping, Shueyli, and Salwín valleys, and leave but one large stream, the Mikong, to cross ere reaching the Yangtse Kiang, at a point near Li kiang fu, navigable at all seasons—the main artery of China. The total distance of such a route from the plains of Asam at the Namphuk to the Yangtse I estimate at 300 miles to 350, including windings, and to clear out a serviceable bridle path or fair weather road on this I estimate would cost but 10,000*l*. The present path for long distances is a mere jungle track often obstructed by fallen trees; small deep gullies necessitate long *détours*. Were some of the jungle removed and fallen trees, a few strong logs felled over the little streams would make a good commencement.

I need not say much regarding the advantages of such a route, if available. For political reasons it was once thought desirable to discourage direct intercourse between India and China; but that day has departed. England is now one of the three great Asiatic powers, and the time has arrived when we must not only examine our passes west and east, but cultivate as far as possible a profitable and peaceful intercourse with China. The state of Upper Burma (once a Chinese province) simply renders this question urgent. At a time also when Australia and America are invaded by such hordes of cheap labourers, labour paying heavily for its own transport to distant and overstocked markets, we see Asam—close to the labour source—suffering from a want of it, and planters paying Rs. 80 and Rs. 100 per head ere they can employ labour of a very inferior stamp.

S. E. PEAL

KARL FRIEDRICH MOHR

BY the death of Dr. Mohr, of Bonn, which is just announced, the science of chemistry has lost a worker whose labours have extended over nearly half a century, and have led to great and valuable results.

Dr. Karl Friedrich Mohr was born at Coblenz in November, 1806. His earliest work was devoted to the continuation of the Pharmacopœia, established by Geiger. The work by which he will be best remembered is the "Lehrbuch der chemisch-analytische Titrirmethode," which appeared in 1855 and 1856, the second, and considerably enlarged edition, appearing in 1862. His published papers, which are very numerous, arrange themselves in two classes mainly, those devoted to meteorology and those having a bearing on volumetric analysis. Ground-ice, the earliest information about ozone, St. Elmo's fire are among the subjects of his earliest, and among his later the lower ends of lightning conductors, hail and rain, and confirmation of his theory of the formation of hail. The other more numerous class of papers on analysis extend over nearly fifty years. His examination of the method of separating copper and silver appeared in Liebig's *Annalen der Chemie* in 1832, to be followed by others on the condensation of chlorine, on Marsh's method, preparation of barium hydrate, the reduction of silver chloride, the action of the air on arsenides, and thirty years later on the value of indirect analysis, on nitrate determinations, the estimation of the different oxides of manganese, analysis without the use of weights, examination of a method of determining the specific gravity of liquids with a watch, phosphoric acid determinations, &c.

About ten years ago he published his "Allgemeine Theorie der Bewegung und Kraft," and shortly afterwards "Mechanische Theorie der chemischen Affinität."

About four years ago he sent to Liebig's *Annalen der Chemie* a curious paper on the nature and mode of origin of meteorites. He finds that all the silicates present in meteorites contain a little water, and when heated strongly or fused have a decreased specific gravity; that some meteorites contain organic compounds like certain terrestrial carbon compounds, but that meteoric iron contains no combined carbon.

THE INTERNATIONAL ASTRONOMICAL SOCIETY

THE eighth Annual Meeting of this Association was held at Berlin on September 5 to 8. The sixth and seventh meetings of the Society were held at Leyden (1875) and at Stockholm (1877). At the latter place Berlin was selected for the next general meeting, to be held in the present year. This city being more centrally situated for the greater part of the members than Leyden or Stockholm, it was expected that a rather large proportion of the Fellows of the Society would meet there; and so it has proved. There were present the following sixty-one astronomers, mechanicians, and opticians:—Abbe (Jena), Auwers (Berlin), Baeker (Nauen), de Ball (Gotha), H. G. van de Sande Bakhuyzen (Leyden), Bamberg (Berlin), Bansa (Frankfort), Becker (Berlin), Behrmann (Elsfleth), Bergmann (Berlin), Boguslawski (Berlin), Bruhns (Leipzig), Bruns (Berlin), Denker (Hamburg), Drechsler (Dresden), Elkin (New Orleans), Engelmann (Leipzig), Förster (Berlin), Franz (Königsberg), Friesach (Graz), Fuess (Berlin), Galle (Breslau), Gyldèn (Stockholm), Hasselberg (Pulkowa), Huggins (London), Kempf (Potsdam), v. Knorre (Berlin), Kreutz (Bonn), Krüger (Gotha), Küstner (Strassburg), Lehmann (Berlin), Lehman-Filhès (Berlin), Lohse (Potsdam), Maywald (Berlin), Merz (Munich), Möller (Lund), Müller (Potsdam), Neumeyer (Hamburg), Oppenheim (Berlin), Oudemans (Utrecht), Palisa (Pola), Pechüle (Copenhagen), v. Plaenckner (Gotha), Pihl (Christiania), Reichel (Berlin), O. Repsold (Hamburg), Romberg (Pulkowa), Rosèn (Stockholm), Rümker (Hamburg), Safarik (Prag), Schönfeld (Bonn), Spörer (Potsdam), Tiede (Berlin), Tiele (Copenhagen), Tietjen (Berlin), Valentiner (Mannheim), Vogel (Potsdam), Wanschaffe (Berlin), Winkler (Leipzig), Winnecke (Strassburg), Wittstein (Leipzig). Hence, besides forty-six Germans, there were present three Fellows from Austria, three from Sweden, two from Holland, two from Denmark, two from Russia, and one each from America, England, and Norway.

The Council, composed of Prof. Krüger, President, Prof. Förster, Prof. Gyldèn, Prof. van de Sande Bakhuyzen, Vice-presidents; Prof. Bruhns, Librarian, Director Auerbach, Treasurer; Secretaries, Professors Schönfeld and Winnecke, met on September 1, to consider the matters to be submitted to the meeting.

The day before the opening of the general meeting there was unveiled at the Berlin Observatory, in the presence of Encke's son and daughter, surrounded by many distinguished guests, the bust of the distinguished astronomer, who founded the new observatory at Berlin, and rendered it famous by incessant labour. The bust was made by the celebrated artist, Afinger. Prof. Förster, to whose exertions this acknowledgment of his predecessor is due, recalled to the assembled guests in spirited words the great astronomer's principal merits.

On September 5 the general meeting was opened at ten o'clock in the morning by Prof. Krüger, in the lecture hall of the Royal Academy of Sciences. The Minister for Public Instruction, Herr von Puttkammer, welcomed

the assembly in the name of the Prussian Government, and said that he hoped the new arrangements at the Royal Observatory in Berlin, and the newly-finished Astro-Physical Observatory at Potsdam would be objects worthy of the attention of foreign astronomers.

The President, after having thanked the Minister for Public Instruction, gave a summary of the number of Fellows of the Society. At Stockholm the Society had 258 Fellows; nine of these died, one left the Society, and thirty-five new Members were provisionally admitted by the Council, the number of Fellows being therefore at present 283. It is well understood that by the bye-laws of the Society there are no Associates or Honorary Members. Prof. Krüger then read an historical account, composed by the Council, of those transactions which induced Herr Struve, Director of the Imperial Observatory at Pulkowa, to resign, last year, the office of president. Then the Reports on the business during 1877-79 were read.

The treasurer (Herr Auerbach) not being able to be present at the meeting, Prof. Bruhns read his report on the expenses and the income of the Society. Besides the stock of the various publications, the *Vierteljahrsschrift* and some astronomical instruments, the Society has invested about 40,000 marks.

The librarian (Prof. Bruhns) gave a summary of books received, and stated that a catalogue of all the books had been prepared, and that it was passing through the press.

The secretary (Prof. Winnecke) reported on the publications. There have been printed and distributed to the Fellows since the Stockholm meeting, nine Hefte of the *Vierteljahrsschrift*, viz., vol. xii. Heft 4, vol. xiii. and vol. xiv. Hefte 1-3; he mentioned that it had been tried to add to the biographical notices on deceased astronomers their portraits in photography. Of the quarto publications there had just appeared:—

No. xiv.—"Fundamental-Catalog für die Zonenbeobachtungen am nördlichen Himmel. Herausgegeben im Auftrage der Zonencommission der Astron. Gesellschaft von A. Auwers."

No. xv.—E. Hartwig, "Untersuchungen über die Durchmesser der Planeten Venus und Mars nach Heliometermessungen auf der provisorischen Universitätsternwarte zu Strassburg, mit Hinzuziehung der anderweitigen vorhandenen Mikrometerbeobachtungen."

The "Ephemeriden der Fundamentalsterne für die Zonenbeobachtungen" for the year 1880, published by the *Redaction* of the *Berliner Jahrbuch*, in co-operation with the Society, has just been issued. Further, two small volumes have been printed for private circulation, the one containing the Minutes of the Council Meetings, the other giving extracts of the *Transactions* of the Council by letter.

The reading of the reports was interrupted by Prof. Förster inviting the members to visit, in the afternoon, the Royal Observatory. He gave a lucid exposition of the arrangements of the newly reconstructed observing rooms. He had had in view to get the temperature in the meridian room as far as possible identical with the outer one. There was constructed a new cupola for an equatorial of 8 feet, and a revolving roof for a new transit, to be used in different azimuths.

For the next day Prof. Förster proposed to visit Potsdam. There the just finished Astro-Physical Observatory should be inspected, and in the evening there would be a *soirée* given by the Government at Glienicke. Prof. Bruhns then read the report on the progress of cometary astronomy; in connection with it Prof. Gyldèn made some remarks on the computations by Dr. Backlund, of Pulkowa, of the absolute perturbations of Encke's comet by his new method.

There were proposed as places for the next meeting in 1881, Strassburg (Winnecke), Graz (Friesach), Brussels (Gyldèn); the election took place on the day following. Prof. Winnecke then gave, in support of his invitation to Strassburg, a detailed account of the new observatory now nearly finished there, and illustrated it with many drawings, representing the buildings, and explaining the manner of constructing the domes and laying the foundation for the pillars. There had to be provided observing rooms for the equatorial (object-glass 18 Paris inches), an orbit-sweeper (6 inches), the Repsold meridian-circle (6 inches), the altazimuth (5 inches), the Cauxoix-transit (5 inches), and different smaller instruments. There were a great many peculiarities differing from existing observatories, and Prof. Winnecke was very anxious to know if these innovations would turn out to be improvements.

Dr. Hasselberg (Pulkowa) spoke of the light emitted by gases induced by electricity and low temperature.

Dr. Drechsler (Dresden) reported on the collections of the Mathematical Saloon at Dresden, and distributed copies of a catalogue of them.

Prof. Saffarik (Prague) spoke on his observations on the colour of stars, principally on those of α Ursæ maj., the colour of which is said to be considerably and periodically variable. His own results do not confirm at all the supposed variability. This matter was then discussed between Herren Oudemans, Saffarik, and Winnecke.

Prof. Förster laid before the meeting (1) a volume, just published, in German, containing the observations of Dr. v. Konkoly at O'Gyalla; (2) different drawings of nebula from Herr Tempel at Arcetri; (3) an account by Dr. v. Konkoly of the new observatory, established in Hungary, at Kalocsa, by the Archbishop of Haynald. The director of this new observatory is Dr. Braun, well known by his attempts to register automatically the transits of stars.

September 6.—Prof. Auwers (Berlin) read the report on the principal undertaking of the Society, to fix by exact observation the places of all the stars down to the 9th magnitude, contained in Argelander's "Durchmusterung des nördlichen Himmels," the number of which is about 200,000. The observatories either busily engaged or having finished the part allotted to them in this work are: Nicolajew (Russia), Albany (U.S.A.), Leipzig (Germany), Lund (Sweden), Berlin (Germany), Leyden (Holland), Bonn (Germany), Helsingfors (Finland), Dorpat (Russia), Christiania (Norway), Kasan (Russia). The printing of some parts of the Catalogue will probably commence very soon, and it is to be hoped the grand work will be finished in a few years.

As the place for the next meeting (1881) the votes were nearly unanimous for Strassburg.

Prof. Gyldèn (Stockholm) expounded a new theory of the variability of stars, trying to reduce the problem to mechanical principles and expounding his views of overcoming the mathematical difficulties.

Dr. Schröder (Hamburg) gave an account of his proceedings in practical optics, aided by theoretical researches. As the hour of leaving for Potsdam was near, he delayed the exhibition of some specimens of his skill to Monday.

September 8.—According to the new elections made at the beginning of this meeting, the Council of the Society is composed, for the period 1879-81, as follows:—President, Prof. Krüger (Gotha); Vice-Presidents: Prof. Auwers (Berlin), Prof. Gyldèn (Stockholm), Prof. van de Sande Bakhuyzen (Leyden); Secretaries: Professors Schönfeld (Bonn), Winnecke (Strassburg); Librarian, Prof. Bruhns (Leipzig); Treasurer, Director Auerbach (Leipzig).

Prof. Tietjen (Berlin) read the report on the small planets, followed by a discussion between Herren Bruhns, Förster, and Oudemans.

Director Palisa (Pola) moved:—"To invite the Council of the Society to consider the means of arranging a better and more economical organisation of the present system of telegraphic announcement of new astronomical dis-

coveries." This motion, after some discussion, was carried unanimously.

Dr. Schröder (Hamburg) then finished the communication begun at the previous meeting. Herren Abbe (Jena), Saffarik (Prague), Bruhns (Leipzig), Winnecke (Strassburg), took part in the discussion on it. Prof. Oudemans (Utrecht) reported on the Gaussian object-glass of the Utrecht Observatory. Dr. Huggins (London) gave an account of his results in photographing star-spectra, and showed some of them to the meeting. Prof. Bruhns (Leipzig) exhibited drawings of nebula and neighbouring stars made by students of the University with small telescopes. Prof. Abbe (Jena) gave an elaborate account of his important theoretical and experimental researches in optics, followed by a discussion between him and Herren Förster and Winnecke. Prof. van de Sande Bakhuyzen (Leyden) explained his researches upon the dependance of the personal error in transit observations from the magnitude of the stars. Prof. Schönfeld (Bonn) reported on the progress of his "Durchmusterung" of the southern heavens. There is finished in observation at present about two-thirds of the whole work.

After a vote of thanks to the Prussian Government, the Royal Academy of Sciences, and the Berlin astronomers, the meeting of the International Astronomical Society was closed late in the afternoon. A. WINNECKE

INFLUENCE OF ELECTRICITY ON VEGETATION

SEVERAL months ago, it will be remembered, M. Grandeau described to the Paris Academy experiments made by himself and M. Leclerc at Nancy and Mettray, whence it appeared that flowering and fructification are retarded and impoverished if plants are excluded from the influence of atmospheric electricity—as by being inclosed in a metallic cage, or being near trees or other objects which may carry off electricity of the air.

Recently M. Naudin has repeated the experiments referred to, but with other plants and in a different climate, and, without wishing to contradict the conclusions arrived at for tobacco and maize (the plants that had been experimented with), he is led to regard the declarations made as too general, inasmuch as his results are almost exactly opposite to those obtained by MM. Grandeau and Leclerc.

It was at Antibes, in the large botanical garden formed by the late Thuret (now Government property), that M. Naudin made his experiments. He had an iron quadrangular cage made, covering a surface of fifty-one square decimetres, and about one metre in height; the frame carried points above (like small lightning conductors), and was covered with iron netting, the lozenge-meshes of this being 0·09m. long by 0·054 m. broad (it intercepted more light than M. Grandeau's, but this is thought insignificant). The cage was placed in a kitchen garden, and the plants it was made to inclose were kidney beans, lettuce, tomato, and herbaceous cotton (the last alone being sown as seed). In the same garden, at 7 metres distance, plants as like the others as possible were planted, and cotton seeds of the same kind sown, but without a cage-cover. The soil was perfectly homogeneous throughout, and all parts of the plot were equally exposed to sunlight, dew, and rain. The experiment began on May 25.

For a fortnight there appeared no sensible difference between the two portions; but about the middle of June it was remarked that the plants of the cage were stronger than those in the open air, and this difference became more pronounced as time went on. The plants, indeed, progressed side by side in this sense, that the flowerings were absolutely contemporaneous in the plants of the same species; and it was the same with formation and maturation of fruits. But it was quite otherwise with the quantity of vegetable matter produced in a given time and on the same extent of soil, and this difference was entirely in favour of the caged plants.

We may take the figures tabulated by M. Naudin for the tomato (examined August 14), as a good example of this:—

	Tomato in open air.	Tomato under the cage.
Length of the principal stem ...	0·80 m.	... 1·0 m.
Total weight of the plant cut at the level of the ground, fruits included	2·072 kg.	... 3·754 kg.
Number of ripe fruits and green fruits of all sizes ...	37	... 83
Weight of the whole of the fruit detached from the plant	1·80 kg.	... 2·162 kg.

The other plants gave a similar testimony in favour of the withdrawal of atmospheric electricity. Thus, the total weights of the bean plants were respectively 142 gr. and 167 gr.; and of the lettuce 337 gr. and 427 gr. The cotton plants were weakly (as there had been no watering), but their evidence was in the same line as that of the others.

The injurious influence, which, according to M. Grandeau's theory, trees exert on plants in their neighbourhood, by withdrawing atmospheric electricity, is also considered by M. Naudin to be only a special case. Besides, it is easy to ascribe to this withdrawal what is merely the result of the shade cast by trees, and especially of the exhaustion and desiccation of the ground by their roots, which often extend to a great distance. On the other hand there are many plants which seek the neighbourhood of trees, and which even thrive only under their shadow, and these, probably, must be adapted to a diminution of atmospheric electricity. At the Villa Thuret, M. Naudin remarks, there are several lawns quite inclosed by trees (pines, firs, cypresses, &c.), many of which are adult and of pretty good size. These lawns contain, besides their grass, thousands of anemones (*A. pavonina*, *A. cyanea*, *A. stellati*), some of pure race, others hybrid, whose flowers present all shades of red, rose, purple, white, and blue. The appearance is striking when the flowers come out in March or April. The flowering is not entirely contemporaneous throughout the lawn; it begins near the trees, and gradually extends to the middle of the lawn; the difference of time between these two extremes being twelve to fifteen days. Moreover, the anemones nearest to the trees, in addition to their relative precocity, are generally stronger and taller, and have broader, perhaps more brightly coloured corollas, than those in the middle of the lawn.

From the observations described, M. Naudin is disposed to think the question as to the influence of atmospheric electricity on plants is complex, and far from being decided as yet. This influence, in all probability, is modified first by the very essence of the species, which must behave, in regard to atmospheric electricity, as to other agents of vegetation, that is to say, in very diverse manners; then it is modified by climate, season, temperature, degree of light, dry or wet weather, perhaps also by the geological structure or mineralogical composition of the ground, the layers of which, superficial or deep, may not be equally conductive of electricity. It is possible, lastly, that all tree species may not alike withdraw the electric *effluves* of the atmosphere, and this is a point necessary to be determined. Until these numerous and so obscure conditions of the problem before us are sufficiently known, we should regard as premature any conclusion which is applied to the whole, or even only to the generality of the vegetable kingdom.

THE DIFFUSION OF LIQUIDS

IT is fortunate that various branches of the work with which Graham's name will always be connected are now attracting the attention of physicists. At the

beginning of this year Prof. Osborne Reynolds gave, in a remarkable paper,[1] the results of experimental researches "On Thermal Transpiration of Gases through Porous Plates," and showed the existence of a class of very marked phenomena which had escaped the notice of other observers. More recently Dr. John H. Long has studied the diffusion of liquids,[2] starting from the work of Graham, which must be regarded as the first and only general investigation of this subject we possess. Dr. Long's results will be briefly given in his own words, but it may be well to draw attention, as he does, to a few facts connected with the history of the subject. In two papers read before the Royal Society in 1850, Graham established that—

1. The velocity of diffusion is different for each substance in solution.

2. The amounts of salt diffused in a given time from solutions of the same substance, but different concentrations, are very nearly proportional to the concentration.

3. The amount of salt diffused from a given solution increases with the temperature.

Fick subsequently showed that liquid diffusion may be compared to the conduction of heat, that is, the spread of salt particles through water is in many respects analogous to the spread of heat in a conducting body, and that formulæ, similar to those established by Fourier for the latter case, may be applied in the former.

Certain experimentalists then employed optical methods of observation in determining the rate of diffusion of salts in solution, but Stefan showed that the optical methods "are based on a false assumption, and that they can therefore give only false results." It will be sufficient to state, however, that after a careful review of the work of the several investigators, Dr. Long divides the researches into two classes :—

1. Those which are concerned with the physical side of the question, that is, with the determination of "the constant of diffusion" for a single substance. To this class belong the researches of Fick, Simmler, and Wild, Voit, Hoppe-Seyler, Johannisjanz, Weber, and Stefan.

2. Those which treat the subject from a chemical point of view, by comparing the rates of diffusion of many different substances. To this class belong the investigations of Graham, Beilstein, and Marignac. Dr. Long points out that "in regard to the first class it may be said that a very satisfactory end has been attained. The proof of Fick's law by Weber and Stefan, and the determination of the influence of temperature and concentration of solution by the former, leave little to be desired in connection with this part of the subject. The same cannot be said, however, of the other, the chemical side." The experiments of Beilstein are not sufficiently numerous to establish much with certainty, and those of Graham and Marignac, while agreeing well among themselves, do not establish the dependence of diffusion on the molecular weight or other physical property of the substance employed.

Facts such as these have led Dr. Long to undertake a lengthy series of experiments, in which he employed a method that renders it possible to determine the rate of diffusion from hour to hour, and to insure that the diffusion takes place into a medium whose concentration is always zero. His apparatus may be roughly described as consisting of a U-tube placed in a beaker, which contains the solution to be investigated. The ends of the tube are bent over the beaker, one end being connected with a funnel into which water slowly drops, displacing the solution in the U-tube, which flows out from the other end at about the rate of 40 cc. in an hour. The base of the U-tube is open, and is connected with a short vertical tube whose internal diameter is 15 mm. This larger tube is open only at the bottom, and is arranged concentrically with the beaker.

[1] *Proc.* Roy. Soc., 1879, p. 304.
[2] A dissertation presented to the Faculty of Science of the University of Tübingen, 1879.

Diffusion thus takes place between the solution *below* the line of junction of the short tube with the U-tube and the water contained in the latter, the diffused particles being carried away and discharged; in other words, there is diffusion between a level of constant concentration and a level "of concentration zero." Space will only permit us to notice the general conclusions at which Dr. Long has arrived. He observes that no simple relation is recognisable between diffusion and other physical phenomena if we merely state the results in *grammes* of substance diffused. If, on the other hand, the results are stated as the numbers of *molecules* diffused, several interesting relations appear. For instance, it can be shown that the chlorides, bromides, and iodides of the alkaline metals form a series in which NH_4 stands between K and Na; and in this series the chloride, bromide, iodide, and cyanide of potassium have nearly the same rate. The chlorides of the dyad metals Ba, Sr, Cr, and Mg are also seen to form a series as to their rates of diffusion. It can further be shown, by comparing Kohlrausch's results on the electrical conducting power of liquids with the diffusion rates, that those salts which in solution offer the least resistance to the passage of the galvanic current are the ones which diffuse most rapidly. In most cases it appears that the salts having the greatest molecular volume diffuse the best, and those salts which absorb the greatest amount of heat on passing into solution are also the ones which diffuse most rapidly.

Dr. Long shows that Graham's view that no relation exists between the molecular weight and the rate of diffusion requires modification, for the alkaline chlorides, bromides, and iodides stand in the same order as regards molecular volume, rate of diffusion, conducting power, and latent heat of solution.

In conclusion Dr. Long indicates the direction in which he proposes to continue the research, which, we may add, bears evidence of being the work of an able physicist, from whom many valuable researches may be expected.

W. CHANDLER ROBERTS

THE PARKES MUSEUM OF HYGIENE

THERE is one all important matter with which neither the great Institution in Bloomsbury nor that at South Kensington has virtually any concern; this important matter is Hygiene, the knowledge and application of the laws of life, which in so far as they are perfect banish disease from the human race. The Parkes Museum of Hygiene has been formed to promote this department of the numerous applications of science.

In the spring of 1876 the movement for the formation of the Parkes Museum commenced. It was the outcome of a very general desire to perpetuate in some useful way the memory of the late Dr. Parkes, whose life had been so unselfishly spent in promoting the welfare and happiness of his fellows by extending the knowledge of the laws of health, and whose untiring energy and keen intellect did such good service in clearing away the ignorance and superstition which accepted disease as the inevitable accompaniment of human life in this world. The movement rapidly developed into shape, and finally the Parkes Museum of Hygiene was opened to the public in June last, with a fairly representative collection of mechanical appliances, models, plans, and books, designed to promote health, of which a descriptive and illustrated catalogue was published. Since then so many valuable additions have been made to the museum that an enlarged and improved catalogue has been issued. The affairs of the museum are administered by an executive committee of which Sir William Jenner is chairman, and at present the cost of maintaining the museum has to be met wholly by voluntary contributions. The collection of appliances, models, &c., is temporarily located in the largest room of the south wing of University College, which, together

with a second room for the Library, has been generously placed at the disposal of the executive committee, by the council of the College, until such time as a separate building can be provided for the museum. The articles exhibited are arranged in six classes, and a brief description of these will serve to indicate sufficiently that the museum is likely to be of great service to those engaged in studying the sanitary construction of houses and other branches of hygiene. It should be stated that the classification is only a temporary one.

In Class I. (Engineering) will be found plans, sections, and models of systems of drainage for cities, towns, and villages, including the whole of the contract drawings used in connection with the construction of the present system of drainage in the metropolis. Maps, &c., illustrating the physical geography of this and other countries, plans of existing and proposed means of water supply for towns, sections of geological formations, and views of the position and surroundings of places noted as health resorts, apparatus in connection with water-supply, and the sinking of wells, are also included in this class.

Class II. (Architecture) consists of general designs for dwellings, hospitals, and other buildings, together with examples of the details of construction. This is by far the largest and most complete section of the museum; already it includes hundreds of models, or specimens of mechanical appliances, and modes of building construction—illustrating in detail the several parts of a well-built house, from the foundation to the roof—bricks, concrete, and other material for walls; artificial stone as a fireproof substitute for timber, &c., so commonly used for heads over door and window openings; also water-closets of every description; baths; stoneware, lead, and iron pipes; syphon and other traps; yard gullies, and contrivances for disconnecting the main sewers from the house pipes, may be seen and compared. Windows and doors so arranged as to give ventilation to the apartment in which they are fixed, stoves of various kinds, ventilating gas lamps, cowls for chimneys, and soil pipes, and other mechanical appliances designed to promote health in connection with architecture, make up this department.

In Class III. (Furnishing) are arranged specimens of school and household furniture presenting features of hygienic interest, including English and foreign oil lamps, specimens of wall papers, arsenical and non-arsenical; and here it may be interesting to state that the library of the museum has been decorated throughout with the new paint, in which zinc white is used as a substitute for white lead.

Class IV. (Clothing) is intended to include fabrics of various kinds used for clothing, with explanation of their properties and uses; but at present this class is only represented by some specimens of army clothing, and a few articles of dress coloured with arsenical pigments.

Class V. (Food) has been largely contributed by the authorities at South Kensington and Kew. It includes a number of large diagrams illustrating the component parts of food and the adulteration of articles of food in common use; samples of gluten bread and other foods for invalids; preserved fruits, seeds, &c.; different kinds of filters, and samples of water.

Class VI. (Preservation and Relief) is composed of all that relates to the hospital, the prevention of accidents or diseases peculiar to certain trades or occupations; disease charts, means for safety and rescue in case of fire, or accidents at sea; stoves for disinfecting purposes, Turkish bath apparatus, &c.

A library is being formed of books relating to hygiene. Exclusive of pamphlets, about 350 volumes are now deposited in the museum for reference, and in addition to these the reading-room is supplied with periodical publications and reports.

It will thus be seen that the Parkes Museum is fairly established. Owing to the limited means at the disposal of the Committee the museum is only opened to the public free on Tuesdays, Thursdays, and Saturdays, from 10 to 2 o'clock. This is perhaps a convenient time for architects, doctors, and other professional men, but it would be more completely supplying a public want if so beneficial an institution were opened during the evening, or at some such time when artizans and those actually engaged in building construction and sanitary work, might best avail themselves of the opportunities for gaining that enlightenment and knowledge which frequent and studious inspections of the contents of this museum of Hygiene would naturally afford them.

NOTES

THE building of the U.S. National Museum is approaching completion at Washington. It stands in the close neighbourhood of the Smithsonian Institution, but is of so different a style of architecture that it will not seem to dwarf the older structure by comparison. The area required for the museum, *Science News* informs us, is 327 feet to a side; in all, about 100,000 square feet, which is a somewhat greater space than the "Government Building" covered at the Centennial Exhibition; but is intended to be capable of holding and satisfactorily showing at least twice as many objects. The building is a square, with ornamental towers at the corners. It rises by a succession of clerestories to a centre surmounted by a dome. The height of the roof at the outer edge is 27 feet; the central room covered by the dome is 90 feet high. Exclusive of the towers, there are seventeen rooms in the interior, and of these apartments five are 65 feet square, four are 65 by 52, four are 91 by 52, and four are 101 by 65; the last mentioned being 45 feet high, and the rest of lesser heights except the one under the dome. The corner towers contain about 160 rooms, of which sixteen are 30 feet square, sixteen are 30 by 20, and the remainder are about 13 feet square, but arranged in suites of twos and fours. The larger of the tower-rooms will probably be kept for distinct collections, open to the specialist but not to the public. In the general exhibition rooms, there will be 5,000 feet of dead wall against which cases can be placed, and these if set end to end would extend over 8,000 feet. The total length of shelving in these cases will be 28,000 feet; the area, 74,000 square feet; a visitor who examines all the cases will traverse a circuit of nearly three miles. The museum will contain all that the Government displayed at Philadelphia; all the exhibits of foreign countries which were presented to the United States at the close of the Centennial show; the accumulations of the national surveys; the collections which are now overrunning the Smithsonian and the Patent Office, and a very extensive and complete exhibit of our fishing industries. Not a particle of wood will be used in constructing the building; hence it will be fireproof. It is to be warmed by steam in winter, and perhaps will be cooled in summer, so as to give a uniform temperature throughout the year.

THE death is announced of Dr. Eduard Fenzl, of Vienna, Professor of Botany and director of the Imperial Botanical Cabinet. Dr. Fenzl was a member of the Vienna Academy of Sciences and vice-president of the Vienna Horticultural Society. He died on September 29 last at the age of seventy-two years.

AT Baden-Baden the German geologists held their meeting after that of the German Association was over, viz., on September 26 and 27. Prof. Knop, of Karlsruhe, presided. There were some sixty members present from all parts of Germany and Austria. Mineralogical, geological, and palæontological papers were read by Professors Beyrich, Knop, Beneke, Häusler, Baumhauer, Eck, von Mojsisovics, and Tschermak.

THE American Association have selected Boston for their meeting next year, a pressing invitation from San Francisco

having meantime been declined. The president at the Boston meeting will be Prof. Morgan, of Rochester.

M. OTTO STRUVE, as our readers probably know, was recently in the United States, when he visited the works of Mr. Alvan Clark, the celebrated optician, and ordered an object-glass of 80 cent. diameter for Pulkowa's Observatory. We are informed that in consequence of that visit, Mr. Clark has gone to Paris in order to have the glass cast at M. Feil's works, rue Lebrun.

THE opening of the Practical School of Astronomy, of which we have already spoken, will take place very shortly at the Paris Observatory. The delay which has occurred has been occasioned merely by the absence of M. Ferry, who has been travelling through the whole of the provinces advocating in favour of Article 7 of his Education Law.

A NUMBER of scientific men are organising a Geographical Society in Algiers. The number of subscribers is not less than 200, and a general meeting has been convened for electing the officers of the Association. The success of that movement has led others to attempt the foundation of an Algerian Society for the Advancement of Science; but this is not likely to be successful, the attempt being premature.

PROF. PIAZZI SMYTH has been advocating the erection on one of the heights of Cyprus of a sort of Imperial Observatory, for which he thinks its clear atmosphere and sunny climate peculiarly adapted. He wonders how the British astronomers can exist at all in this cloudy and smoky climate.

THE following is the title of the essay to which the Howard Medal of the Statistical Society will be awarded in November, 1880. The essays to be sent in on or before June 30, 1880:—"The Oriental Plague in its Social, Economical, Political, and International Relations: Special Reference being made to the Labours of Howard on the Subject." The Council have decided to grant the sum of 20*l.* to the writer who may gain the "Howard Medal" in November, 1880.

THE Trustees of the British Museum are making arrangements to light the reading-room by means of the electric light. Waterloo Bridge has been lit up by ten electric lamps on the Jablochkoff system.

FROM a number of the *Otago Witness* which has been sent us we are pleased to see that science has not a few enthusiastic disciples in New Zealand. Prof. Black, of Dunedin, we are told, delivered the fifth lecture of the course in the chemistry lecture-room on July 12. For want of sufficient accommodation, the lecture was delivered twice—to the far-distance teachers, from 12.30 to 4 P.M.; and to the teachers resident in Dunedin and suburbs, from 5 to 9 P.M. As usual, the lecture-room was full on each occasion, about 180 teachers—80 of whom were ladies—being in attendance. Many of these came from a great distance. One gentleman came from Ngapara, 93 miles north from Dunedin; another from beyond Clinton, 75 miles south of Dunedin—thus bringing together teachers whose schools are 168 miles apart. About 20 of the teachers who attend these classes come more than 60 miles—from Lawrence, Oamaru, and beyond Balclutha. Over 60 of them come more than 30 miles. "Altogether, we believe," the *Witness* states, "the distances travelled to attend a course of lectures is quite unprecedented in any country, and our teachers are to be greatly commended for the interest which they take in the subject."

THE first meeting of the session of the Society of Medical Officers of Health will be held at 1, Adam Street, Adelphi, to-morrow at 8 P.M., when an inaugural address will be delivered by the president, Dr. J. S. Bristowe.

PROF. CORFIELD'S Introductory Lecture to the Ladies' Class of Hygiene and Public Health at University College will be delivered on Wednesday, October 22, at 3 P.M. The course will be continued on succeeding Wednesdays at the same hour.

IN the *Revue Scientifique* of September 27 is an interesting paper by E. B. Renault on the Comparative Structure of some Stems of the Carboniferous Flora.

AT Belgrade there were two shocks of earthquake on Friday and one on Saturday; on Saturday a shock was felt at the Roumanian town of Turn-Severin on the Danube.

DR. J. E. TAYLOR'S Winter Course of Lectures in connection with the Ipswich Museum will be on Flowers and Fruits. The average attendance at these lectures is 500 people, chiefly of the working class.

THE third part of Dr. Dodel-Port's excellent "Atlas der Botanik" is to be published within a few days. It will contain: (1) *Ulothrix zonata;* the most important points in the whole development of one of the lowest sexual chlorophyll *Algæ*. This treatise is an abstract of a monograph which the author published some years ago and which excited considerable interest at the time. The original treatise was noticed in these columns (vol. xv. p. 511). (2) *Polysiphonia subulata;* the fertilisation of a red sea-weed by animalcules, of which we gave an abstract a few numbers back (vol. xx. p. 463). (3) *Schizomycetes;* different types of putrefaction- and infection-fungi (with *Spirochæte Obermeieri*, the contagium of a certain typhoid disease). (4) *Bacterium anthracis;* the whole development of the carbuncle fungus according to the researches of Prof. Nägeli, of Munich, and of the author himself. (5) The development of the prothallium of the fern genus, *Aspidium*, from the spore to the formation of embryos. (6) *Cycas circinalis* and *C. revoluta;* female plant, female flower, carpel and fruit of the lowest flowering plant. Besides his "Atlas der Botanik," which involves years of hard work, Dr. Dodel-Port is about to publish a profusely illustrated work, "Bilder aus dem Pflanzenleben," which is written in popular language and is intended to bring the most interesting and most important questions of scientific botany before a larger public. The first part of this new book is to appear early in November.

AN interesting surgical case was recently reported by M. Larrey to the French Academy of Medicine. A young carpenter received a blow from an axe on his right foot. The big toe was almost completely detached; it was held merely by a small thread of skin, and hung on the side of the foot. Dr. Gavey, who was at once called in, detached the toe completely, then after having washed it and the wound on the foot, he adapted the two surfaces as well as possible one to the other, and made them hold together by means of strips of lint soaked with collodion and placed along the toe. When the collodion had set another strip was wound round. Further, an apparatus was used to keep all the parts of the foot in perfect immobility. Twelve days after, the dressing gave no bad smell, the patient was very well, and desired to go out, and twenty-four days after the accident the cicatrisation was perfect.

WE are sure our readers would welcome the very simple scheme proposed by Mr. Clifford Eskell for the giving of receipts by the Post Office officials for the posting of letters or other documents, at the cost of one farthing each. Mr. Eskell has forwarded us specimens of the "posting proofs" proposed by him, and they seem to us both simple and well adapted for their purpose. Some such arrangement as this would often save a world of trouble, and we trust that means will be taken to induce the Post Office authorities to give it a fair trial.

THE Smithsonian Institution, we learn from *Science News*, has lately added to its series of Check-Lists, one by Prof. A. E. Verrill, which originated in the useful purpose it would serve in the scientific work of the U.S. Fish Commission. It is entitled

"Preliminary Check-List of the Marine Invertebrata of the Atlantic Coast from Cape Cod to the Gulf of St. Lawrence." The paper, however, is not a complete catalogue. The whole of the groups Entomostraca, Nematoda, Rotifera, Trematoda, Cestoda, Acanthocephala, most of the sponges, and the protozoans, have been omitted. This is due to the fact that Prof. Verrill considers our knowledge of them too inadequate to justify a place in this check-list. The amphipods are represented by a blank, and the annelids leave room yet for many additions. Moreover, species not found at a depth of less than 200 fathoms are omitted, and likewise those from the Grand Banks of Newfoundland, which will be the subject of a separate publication. Despite these limited conditions of the work, a surprising number of marine invertebrates is catalogued—no less than about 11,000 species. Various signs and letters indicate the geographical distribution of many of the rarer species, and add value to the paper, which serves, among other uses, as a partial record of the zoological results of the Fish Commission's dredgings. As yet only a small "author's edition" has appeared; but a revised issue of a large number of copies will soon be sent out.

On October 1 a double ascent, which produced some sensation at Paris, was made at La Villette gas-works. The balloons *European*, 650 cubic metres, carrying two aëronauts, and *Observatoire Aérien*, 350, carrying one, were sent up connected by a telegraphic wire of 120 meters weighing 1,500 grammes, and susceptible of a resistance of 15 kilogrammes without breaking. One aëronaut in each balloon carried round his body an inversion element and a Morse telegraph. Telegraphic signals were exchanged successfully during the connection, which lasted for thirty-three minutes, in spite of the differential motions of the air, which was in a state of rather great agitation. As it was very easy for the aëronauts to keep up conversation, no regular messages were sent through the wires. Other experiments will be made shortly with telephones, and a kilometre wire weighing 27 kilogrammes, and resisting a traction of 100 kilogrammes without breaking. In the experiment of October 1 the rope was disconnected only, because the aëronaut of the *Observatoire Aérien* expressed the wish to ascend to a greater height. As soon as the balloons were separated, each of them parted in a different direction. One of them landed in the north-east of Paris, and the other in the north-north-east. The separating force can be valued to the tenth part of the propulsion. The idea of sending up a couple of balloons connected by a telegraph or telephone wire must be attributed to M. Jovis, who was the captain of the *European*. M. Henry Ménier, the maker of telegraph wires at the Grenelle Works, has long entertained the idea of using the differentiation of velocity of each balloon with the current of air in which it is immersed for steering them with sail or rudder. He is to construct for this purpose a special cast-steel wire, susceptible of great resistance. It remains to be seen what is the practicability of these and other schemes; but the fact of sending up two balloons so connected, and of keeping them in connection at will, unquestionably opens up a large field for future observations and scientific explorations which must be noticed.

Mr. James Paton, Curator of the Kelvingrove Museum, Glasgow, has prepared an interesting report of an official visit he paid recently to the museums and art galleries of Holland and Belgium. All the principal cities of these countries, he shows, are provided not only with magnificent art galleries, but with excellent scientific and technical museums, presenting an enviable contrast to most of the large cities of this much wealthier country. Mr. Paton reads the citizens of Glasgow a lesson which might well be taken to heart by other towns both in England and Scotland. "In point of population, wealth, and resources," he concludes, "not one of the towns alluded to in this report approaches the city of Glasgow. Taken altogether, their industries are fewer, less diversified, and less extensive, and their access to and command of markets, and consequently their opportunities for commercial development, are not equal to those enjoyed by our citizens. With less ability to maintain their great public institutions, and with less urgent necessity for them, on account of the limited industrial sphere of their inhabitants, these cities have put forth efforts on a scale which, if equalled in Glasgow, could not fail to have a most marked effect on the industrial standing of the city, at once elevating and refining the taste, stimulating thought and research, and suggesting new inventions and combinations. These institutions raise the whole mass of the population to a higher level, and they broaden and deepen the fertilising stream of industrial activity."

Mr. Edward Whymper is about to issue a condensed and cheaper edition of his "Scrambles Amongst the Alps" under the title of "The Ascent of the Matterhorn." It will be published by Mr. Murray. Among other forthcoming books to be published by Mr. Murray we notice the following:—"A History of Ancient Geography," by E. H. Bunbury, F.R.G.S., with index and maps; "The River of Golden Sand," being the narrative of a journey through China to Burmah, by Capt. Wm. Gill, R.E.; in two volumes, with a map and illustrations; "A Lady's Life in the Rocky Mountains," by Isabella Bird; "A Sketch of the Life of Erasmus Darwin," by Charles Darwin, F.R.S.; with a Study of his Scientific Works, by Ernest Krause, translated by W. S. Dallas.—Messrs. Crosby Lockwood and Co. have nearly ready for publication a "Treatise on Metalliferous Minerals and Mining," by D. C. Davies, F.G.S., Mining Engineer. The book will be illustrated with numerous wood engravings.—Mr. David Bogue has in the press a Manual of the Infusoria, by Mr. W. Saville Kent, F.L.S. The volume will comprise a descriptive account of all known Flagellate, Ciliate, and Pentaculiferous Protozoa, and will be accompanied by numerous illustrations; it will probably be ready in March next. Mr. Bogue will also publish shortly a work on the "Sphagnaceæ, or Peat-Mosses of Europe and North America," by Dr. R. Braithwaite, F.L.S. This will be illustrated with twenty-nine plates.—Messrs. Kegan Paul and Co. will publish during the ensuing season the following books bearing upon science:—"The Crayfish: an Introduction to the Study of Zoology," by Prof. T. H. Huxley, F.R.S.; with numerous illustrations; "The Brain as an Organ of Mind," by H. Charlton Bastian, M.D., F.R.S.; with numerous illustrations; "The Brain and its Functions," by J. Luys, Physician to the Hospice de la Salpétrière; with illustrations; "The First Principles of the Exact Sciences explained to the Non-Mathematical," by the late Prof. W. Kingdon Clifford; edited by R. C. Rowe, M.A. The above four books are new volumes of the *International Scientific Series*. "Hygiene and the Laws of Health," by Prof. Corfield, M.D.; "Chapters from the Physical History of the Earth: an Introduction to Geology and Palæontology," by Arthur Nicols, F.G.S.; with illustrations; "Matabele Land and the Victoria Falls: a Naturalist's Wanderings in the Interior of South Africa," by C. G. Oates. "An Introduction to the Science of Language," by the Rev. A. H. Sayce, Deputy Professor of Comparative Philology in the University of Oxford; in two vols. —The first volume of Prof. G. G. Stokes' "Mathematical and Physical Papers," reprinted, with additional notes by the author, from the Original Journals and Transactions, in which they appeared, is now nearly ready. It will be published by the Cambridge University Press.

The additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. W. Leekie; five Peregrine Falcons (*Falco peregrinus*) from Scotland, presented by Sir Mathew W. Risley, Bart., M.P.; four Green Tree Frogs (*Hyla arborea*), a

Fire-bellied Toad (*Bombinator igneus*), a Natterjack Toad (*Bufo calamita*), European, presented by Mr. H. A. Macpherson; six Green Tree Frogs (*Hyla arborea*), European, presented by Mr. A. Leipner, F.Z.S.; a Chacma Baboon (*Cynocephalus porcarius*) from South Africa, deposited; two Rendall's Guinea Fowls (*Numida rendalli*) from West Africa, a Javan Peafowl (*Pavo spicifer*) from Java, three Royal Pythons (*Python regius*) from West Africa, received in exchange; two Saffron Finches (*Sycalis flaveola*), bred in the Gardens.

SOME RECENT EXPERIMENTS ON THE CRYSTALLISATION OF SUPERSATURATED SALINE SOLUTIONS [1]

THE history of the various views held by different experimenters on the nuclear action of substances in exciting the sudden crystallisation of a supersaturated solution, has been already so well described by Mr. Charles Tomlinson, Prof. Liversidge, Prof. Grenfell, and others in their several papers upon the subject, that it is unnecessary to enter into any detailed description of their opinions; suffice it to say that they may be divided into two classes: the first holding the opinion that the crystallisation may be excited by the presence of certain fatty, oily, greasy, or other matters in the form of films; the second that the initial cause of the crystallisation must be sought for in the entrance of a particle of the same salt as that which is in solution.

In 1866 M. Gernez indicated that in the case of certain salts the sudden crystallisation might be brought about by the agency of some other salt perfectly isomorphous with the one in solution; thus a supersaturated solution of magnesium sulphate invariably crystallised when crystals of zinc or nickel sulphates containing seven molecules of water in their composition were introduced. Having been for a long time interested in the crystallisation of such solutions, I determined to carry out a large number of experiments upon carefully purified substances which observations have resulted in a confirmation of the views held by Gernez that truly isomorphous substances are active to solutions of each other.

The two methods employed in the experiments may be briefly stated as follows:—(1) The supersaturated solutions of the salts to be examined were placed in small wide-mouthed flasks; and the solutions of the salts employed as nuclei were introduced into very thin glass bulbs plugged with cotton wool, and suspended through a second plug of cotton in the neck of the flask, in a manner such as is indicated in Fig. 1. (2) A large number of the experiments were also performed by using, instead of the bulb tube for the introduction of the salt employed as nucleus, a tube bent as a siphon, thus ⊓, and like the bulb tube passing through cotton wool plugs in the necks of the flasks; the whole arrangement when complete being as represented in Fig. 2. To perform an experiment the solution in the bulb or in the siphon tubes was crystallised, and after a short time these tubes were gently lowered into the solutions in the flasks and the results observed. When the bulb tubes were used they were gently broken against the bottom of the flask, the contained crystals being thus brought in contact with the solution. To show that the disturbance produced by this breaking had of itself no exciting action on the solutions in the flasks, corresponding experiments were made with bulbs containing clean pieces of glass, when no crystallising action took place, showing that the mere disruption of the solution did not cause crystallisation. The largest number of experiments were, however, carried out by the siphon tube method, which is perfectly applicable after a little practice in the introduction of the tubes. The substances employed were in all cases carefully examined to ensure their purity.

With magnesium sulphate ($MgSO_4.7H_2O$) as a supersaturated solution, it was found that the other sulphates of the same group of metals, namely, those of zinc, nickel, cobalt, and iron, were immediately active in causing the crystallisation of the magnesium solution when they possessed an identical composition with it, as represented by the general formula ($M''SO_4.7H_2O$), M representing the different metals. When these salts contained only six proportions of water crystallisation is sometimes induced, but in this case it is of an entirely different nature, the deposition being slow and gradual. In connection with this group of salts interesting results were obtained with the double salt potassio-magnesic sulphate ($MgK_2(SO_4)_2.6H_2O$), crystals of which, although possessing the elements of magnesium sulphate, were found inactive to a solution of that body. In the case of supersaturated solutions of sodium sulphate ($Na_2SO_4.10H_2O$), the bodies sodium selenate ($Na_2SeO_4.10H_2O$), and sodium chromate ($Na_2CrO_4.10H_2O$), each analogous in form and constitution to the sulphates but containing the elements selenium and chromium instead of sulphur, were found capable of exciting crystallisation in solutions of the sulphate.

Experiments were also performed upon supersaturated solutions of potash alum ($AlK(SO_4)_2 12H_2O$), with crystals of iron and chromium potash alums, bodies agreeing in form and constitution with common alum, but containing chromium or iron in place of the metal aluminium. These bodies were found invariably active in exciting the crystallisation of the common alum solution. As alum crystallises in beautiful octahedral crystals some experiments were made to see how far the mere shape of the crystal could render it active in exciting the crystallisation; and for this purpose cubes of copper pyrites and octahedra of magnetite, both belonging to the same crystalline system as alum but having a different chemical structure, were employed. When these substances in a perfectly clear condition were placed in the alum solutions no sudden crystallisation was produced, showing that mere form alone is inactive in exciting this kind of crystallisation. Crystals of hydric disodic arsenate ($Na_2HAsO_4.12H_2O$) were also found active in the case of the isomorphous hydric disodic phosphate, containing phosphorus instead of arsenic, but otherwise analogous in form and composition. In connection

Fig. 1.

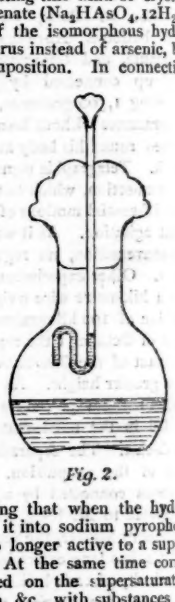


Fig. 2.

with this latter salt it is worth noting that when the hydric disodic phosphate is heated to convert it into sodium pyrophosphate ($Na_4P_2O_7$), this substance is no longer active to a supersaturated solution of the disodic salt. At the same time corresponding experiments were performed on the supersaturated solutions of magnesium sulphate, alum, &c., with substances of dissimilar form and chemical constitution; these bodies, however, invariably yielded negative results, being incapable of exciting the sudden crystallisation of the solutions.

Experiments carried out upon mixtures of similarly constituted and dissimilar bodies, yielded some interesting results. The substances employed were mixtures of the similarly constituted sulphates of magnesium and nickel, and the dissimilar sulphates of magnesium and sodium; experiments were also made with sulphates of nickel and sodium. In the case of these mixtures it was observed that two results might occur:—(A) The nucleus might remain growing in the solution without causing immediate crystallisation; or (B), Crystallisation might be induced at once on the addition of the nucleus; the deposition of the salts, however, differs according to the nature of the substances employed.

In the case of the dissimilar bodies, magnesium or nickel sulphates with sodium sulphate, it was found that a nucleus of either sulphate when gradual crystallisation took place, slowly increased by a deposition of the substance of the same nature as the nucleus added; and that even with the rapid crystallisation of dissimilar bodies the salt deposited consisted essentially of the substance of the same nature as the nucleus added.

[1] Abstract of a paper read before the Chemical Society on March 6, 1879.

With mixtures of isomorphous salts, however, the results were different. In these cases sudden crystallisation on touching with a nucleus producing a separation of both the sulphates apparently always in the proportions in which they existed in the solution. When gradual crystallisation took place with the sulphates of nickel and magnesium the nucleus increased by a deposition of the least soluble salt independent of the nature of the nucleus added. It may be seen therefore from these experiments that truly isomorphous bodies, that is, substances not only possessing the same form but also an identical chemical structure, may be regarded as active nuclei in exciting the sudden crystallisation of supersaturated solutions of each other. I hope shortly to extend the observations upon supersaturated solutions of mixtures, and of compound salts, employing their different constituents as nuclei, as I think by such experiments some light may be thrown upon the relations between these constituents when associated together in solution. There are, however, very few true double salts of which it is possible to obtain thoroughly supersaturated solutions.

JOHN M. THOMSON

ON THE EARLY STAGES OF THE CÆCILIANS

THERE are few groups of vertebrates respecting whose life-history and development so little is known, as the curious snake-like amphibians forming the order *Peromela*, and usually known as Cæcilians. In all the ordinary zoological text-books in use in this country, the early stages of these animals are either left entirely unnoticed, or, at most, allusion is made to Johannes Müller's classical discovery of gill-slits in the young of *Epicrium glutinosum*. Even Prof. Huxley, in his article on the Amphibia in the first volume of the "Encyclopædia Britannica," published in 1875, after an allusion to Müller's discovery, states:—"It is to be regretted that nothing is known of the development of the Peromela" (*loc. cit.* p. 770).

This being the case, it may be useful to call attention to two papers on the development of the Cæcilians, by Dr. Peters, the eminent German naturalist, read by him before the Royal Academy of Sciences of Berlin, and published in their *Monatsberichte*, as their contents seem to be unknown to, or overlooked by, the bulk of English zoologists. The first of these bears the date of January, 1874, the second was read eighteen months later (July 19, 1875). In the first of these Dr. Peters, after noticing the discovery by Müller of gill-slits in *Epicrium*, and its subsequent confirmation by himself (*cf. Monatsbericht*, 1864, p. 303) continues, "it was therefore extremely interesting to me to learn from Prof. Wrzensniowski of Warsaw, who last summer honoured me with a visit, that some years ago the naturalist-traveller Constantin Jelski had sent him from Cayenne a gravid *Cæcilia*, which after its capture had given birth to a young one, and had contained in its uterus several full-grown embryos. Herr Wrzensniowski has now sent me for examination three of the young ones, and the old animal, referable to *Cæcilia compressicauda* (Dum. and Bibr.), and has given with them the following notes, part of which are extremely interesting." These notes are extracted from a letter of Jelski's, dated from Cayenne, November 12, 1866, to Herr Taczanowski, the well-known Polish zoologist, in which he gives his account of an expedition to East Guiana, to a plantation called "Bon Père," belonging to a M. Lalanne, from which he had just returned. After narrating the method of fishing by means of nets adopted, and the great abundance of fish, Jelski continues—"'In the course of the hunt, the negro who was frightening the fish away from the bank, suddenly uttered a loud cry: we all saw something that looked like an electric eel swimming about with worm-like movements just under the surface of the water. M. Lalanne and I held back the negro, who was about to cut the animal into bits with his sword, the net was hauled up, and the creature landed. We all thought it was an eel, but on closer examination decided that it was a gigantic water-worm. I put the creature into a special vessel, and as I had already fish enough, and did not hope to obtain any others, went home. As I was taking this problematical creature out of the vessel, to put it into the calabash, I saw two of them instead of one. The old one had produced a young one. After I had laid the old one on the table, I examined it more closely; it exhibited very slow, tremulous, slight movements. Shortly afterwards I found it in true convulsions. I perceived that it was about to produce a second young one. I placed it in spirit, so as to convince people of its being viviparous. Membranes (*Häute*) were ejected together with the first young one.' Herr Wrzensniowski adds—'After the receipt of the animal, I dissected it myself, and found in the oviduct five young, which I at once extracted, and two of which I send you together with the one that was born in Cayenne. All these examples that were removed from the oviducts were remarkable for a membranous outgrowth on the necks which was very easily torn off, and left a transverse linear scar, as in the specimen born in Cayenne, so that only a single specimen has retained this outgrowth till now. In the uterus I perceived nothing else noteworthy; the embryos lay in a dilatation of both oviducts, just as they now are in the spirit, without being covered by any membranous envelopes. I conclude therefore that the membranes, which, according to Herr Jelski, were extruded together with the young one from the oviduct were nothing else than the shed neck-vesicles (*Nackenblase*), which we could not find again in the parcel from Cayenne.'"

"The female forwarded to me, whose oviducts had been removed, was fifty cm. long, and four cm. deep in the middle; its head measured three cm.; of the young ones, the newly-born one, and one of the embryos, had a length of 157 millims., and a depth of twelve millims.; their heads measured eleven millims.; the other was only 136 millims. long and twelve millims. deep; its head was ten millims. They show no trace of the skinny vertical swimming-tail (*Flossensaum*) which both J. Müller and myself found on the hinder ends of the young *E. glutinosum*. But what surprised me much more was that there was no trace to be found of lateral gill-openings, like those which have now been discovered in several young examples of *Epicrium glutinosum*. The head and fore part of the body in all three specimens lay bent back towards the sides of the belly, so that apparently in the uterus this curved part, that is the under side of the head, is closely applied to the body, and the end of the body also seems to have been recurved towards the sides of the belly. From the neck of the one specimen two smooth vesicles, fifty-five millims. long, of irregular shape, and variously constricted, project; on them a blood vessel ramifies, whilst at their narrow transverse base they are connected together, though unfortunately no more can be learnt as to their original position, except that from their flat convex-concave form they are probably closely applied to the body.[1] On the transverse scar, where the epidermis is absent, which these vesicles leave after falling off, on each side a small hole is visible, the lumen of one or two vessels, which are in connection with the aortic arches of their side. These vesicles therefore are external gills, which resemble the bell-shaped external gills which Dr. Weinland discovered in the larvæ which develop in the external dorsal pouch in the female *Notodelphys* (*Opisthodelphys*) *ovifera*, and which he has described so well and thoroughly (Müll. *Archiv*, 1854, p. 457, Taf. xviii., Fig. 5, 6)." After some prefatory remarks on the distribution of the vessels to these bladder-like gills, Dr. Peters concludes:—"In any case, this discovery of a new agreement in the development of the Cæcilians with the other Batrachians is one of the greatest scientific interest, for in fact, not only is there now no doubt that, as in the *Anura*, so also amongst the Cæcilians a different gill-structure (*Kiemenbildung*) obtains, but it can also now be stated with certainty that in these animals also, for which the establishment of a third class or sub-class of Amphibians has even been proposed, no amnion or allantois are developed, that, in part at least, they are viviparous, and that, at a certain period of the year, they are to be sought for, not in moist earth, but in water. Moreover, it is extremely probable that these animals, which only occur to fishermen rarely, and at a certain season, are not recognised by them, but are in fact shunned and destroyed on account of their ugly and worm-like aspect, and on this account so rarely come into the hands of collectors in their larval state."

In his second paper, read July 19, 1875, Dr. Peters contributes some further notes on the same subject, giving figures illustrating the young *Cæcilia* with its bladder-like gills still *in situ*, as well as the scars left on the neck after the fall of the gills, and the distribution and relations of the great vessels and aortic arches. The bulk of the paper is taken up with an account of the anatomy of the young Cæcilians, but a few additional remarks on other points are given which we here reproduce. "As was there (*i.e.* in his first paper) stated, in this species the embryos at birth are at most three and two-thirds smaller than the mother. It is also known that the young of *Epicrium glutinosum*, in which

[1] This is also very probable from the observations of Weinland on *Opisthodelphys ovifera*, where the bell-shaped gills envelope most of the body.

the lateral gill-slits are still visible, are even larger as compared with the parent animal than is the case in *Cæcilia compressicauda*. According to this, one might almost believe that such a relation in size is universal in the embryo Cæcilians. On the other hand, one might conjecture that a development with external vesicular gills, which obtains only exceptionally amongst the *Anura*, as in *Opisthodelphys* and *Nototrema*, occurred more commonly amongst the Cæcilians. The few observations however which have as yet been made on the other species of Cæcilians do not confirm this. Thus A. Dumeril, in a young *C. oxyura*, 50 millims. long, has found on each side of the neck a branchial cleft, which it is true lies somewhat higher than in *E. glutinosum*, but still proves that in this species no external vesicular gills are developed (*Mem.* Soc. Sc. Nat. Cherbourg, ix., taf., 1 Fig. 8).

Further, Prof. Möbius on the occasion of his late visit to the Seychelles, brought back several examples of *C. rostrata* (Cuv.), of very varying sizes (from 35 to 240 millims.) which have neither branchial clefts, nor a swimming-tail, nor do they show the scars on the neck that accompany the vesicular gills. All this leads one to conclude that the development of the Cæcilians, like that of the *Anura*, goes on in very various ways, and that in this field too important discoveries are still to be made. It cannot therefore be too deeply impressed on naturalists who visit tropical countries where Cæcilians are found, to give to this subject their especial attention."

PHILOSOPHY OF THE PUPATION OF SOME BUTTERFLIES[1]

THE comparatively sudden transitions from one state to another in insects, have always excited the keenest interest. The change from larva to chrysalis in those butterflies known as *suspensi*, and which in the chrysalis state hang from the tip of the body, has, perhaps, been looked upon as the most wonderful. The preliminary acts in the performance have been pretty well observed and described by various authors since the days of Vallisnieri. The larva hangs by the anal end, turning up the anterior part of the body in a more or less complete curve, and the skin finally splits from the head to the front edge of the metathoracic joint, and is worked back in a shrivelled mass towards the point of attachment. Now comes the critical feat which has most puzzled naturalists, viz., the independent attachment of the chrysalis and the withdrawal from, and the getting rid of, the larval skin which such attachment implies.

Réaumur explained it in 1734 by the clutching of the larval skin between alternate sutures of the soft joints of the chrysalis; and his happy and circumspect account from observations made on *Vanessa urticæ* has formed the basis for subsequent accounts; no one obtained a deeper insight into the philosophy of the act until, some two years since, Dr. J. A. Osborne, of Milford, England, discovered that a distinct membrane is concerned in it. In casual observations of the process I had long become convinced that the popular accounts were crude and inaccurate, and I had preserved specimens in the act of transforming, for future study; but the philosophy of the change cannot be satisfactorily made out from alcoholic specimens alone, nor from the study of one species. The present paper is based on observations made on species belonging to more than a dozen genera, the conclusions having been partially presented last June to the Philosophical Society of Washington.

The body of the larva is composed (exclusive of the head) of twelve segments or joints, *and a sub-joint*. It is with this sub-joint that we have here to deal, for to it beneath the rectum are appended the anal pro-legs, and above this is the anal plate.

If we carefully examine the anal plates of the larvæ of the true *suspensi*, we shall find that while they differ in form they have one feature in common, viz., the being furnished dorsally and posteriorly with numerous short spines and points generally retrorse, or so placed that the larva can make use of them in suspending. These special spines on the anal plate are only fully developed after the last larval moult, being more or less obsolete in the earlier stages, and they are also under muscular control. Even in the *succincti*, where, as a rule, the anal plate is not specialised, spines are, nevertheless, sparsely found, especially on the border.

All writers whom I have consulted speak of the larval suspension being due to the entanglement of the hooks of the anal pro-legs in the silk, and do not mention the use of the anal plate, for which the hillock of silk is sometimes spun in special form.[1]

The normal form may be likened to that of an inverted settee, or shoe, or to a ships-knee, and one of the most interesting acts of the larva, preliminary to suspension, is the bending and working of the anal parts in order to fasten the back of the plate to the inside of the back of the settee, while the crotchets of the legs are entangled in the more flattened position or seat. In some cases (as in *Danais*) the hillock of silk is more elongate, and the spines of the truncate plate mostly occur around the lower margin and even beneath it, so that in fastening them the larva seems to be drawing the silk up the rectum. In other cases (as in *Euptoieta*) the plate, in addition to the spines, has a prominent tubercle on each anterior outer border well calculated to lock securely into the silk. After suspension, and as the fluids gravitate anteriorly, the silken hillock becomes more conical (the threads being loosely spun and elastic) and the hooks both of the plate and the pro-legs hang more loosely from it.

In the final getting rid of the larval skin and attachment of the chrysalis there are concerned—

1. Certain factors belonging to the larva and cast off with its skin. 2. Those belonging to the chrysalis; and to intelligibly explain the process it is necessary to more fully characterise and homologise these parts than has hitherto been done.

In the former category, in addition to the natural adhesiveness of the moist, mucous, and membranous corium,[2] there are three physiological factors concerned: (1) the *tracheal ligament*, or the shed tracheæ from the last or ninth pair of spiracles which uniformly become blind or obsolete in the chrysalis; (2) the *rectal ligament* or shed intestinal canal; (3) the Osborne or retaining membrane (*membrana retinens*), which is but a stretched part of the membranous corium that accumulates around the rectum and in the anal pro-legs.

In the second category we have the structural features of the chrysalis. These are, first, the *cremaster* proper, which is the homologue of the anal plate of the larva, and the form of which is foreshadowed in that of said anal plate. This cremaster assumes a great variety of different forms, but in general may be said to be a tapering piece more or less incurved ventrally, and having the ventral and dorsal margins thickened or ridged, and these ridges may be respectively called the *ventral* and the *dorsal cremastral ridges*. This cremaster is surmounted at the apex and sometimes along the ventral ridges by what may be called the *cremastral hook-pad*, thickly studded with minute but stout hooks, which are sometimes compound or furnished with barbs very much as are some of our fishing-hooks, and which are most admirably adapted to the purpose for which they are intended.

Secondly, we have the sustainers (*sustentores*), two projections which homologise with the soles (*plantæ*) of the anal pro-legs, and which take on various forms, but are always directed forward, so as to easily catch hold of the retaining membrane. In the yellow butterflies (as *Callydrias*, *Terias*, *Colias*), where the body of the chrysalis is so thrown back that mere projecting tubercles would not suffice, we find them transformed into actual hooks; while in some of the *succincti* they are little more than a thickening of the anterior margin of the sub-joint. In all lepidopterous pupæ these remnants of the anal pro-legs are more or less indicated, while in certain moths (*Pterophoridæ*) where the pupa is partly suspended, they are, as in the *Nymphalidæ*, covered with long hooks similar to those at the tip of the cremaster.

Thirdly, we have what may be called the *sustentor ridges*, usually connected with the sustainers, embracing them on the outside, and extending backward to the inside of the ventral cremastral ridges, and sometimes, as in *Paphia* and *Limenitis*, forming quite a deep notch, which doubtless assists in catching hold of the larval skin in the efforts to attach the cremaster.

[1] Abstract of a paper read before the American Association for the Advancement of Science, by Prof. C. V. Riley.

[1] It is an interesting fact in this connection that Roesel, who has never had any superior as a delineator of insect larvæ, makes the Nymphalids in his figures all suspend to an elongate conical piece of silk apparently issuing from the anus, with the legs invariably free and in no instance hooked. It is evident, however, from his text, that he was not aware of the use of the anal plate, and since he speaks of the larvæ attaching themselves by the hind legs or extremities, it is equally evident that his figures do not correspond with the text, while the freedom of the legs in his figures is, of course, an error.

[2] What is here termed the *corium* is the membranous layer between the separating larva skin and the forming chrysalis. If, as recent investigations seem to show, it is only the outer half of the dermal layer of the skin which is cast off in the exuviation of invertebrates, and not the whole skin with its three layers, then this membrane is developed between the splitting parts of said outer layer, and is not, strictly speaking, the *corium*.

These sustentor ridges are homologous with the limb of the anal pro-legs and the exposed edge with the posterior border of said limb. They vary much in form, and may be more or less obsolete.

Fourthly, between them is what may be called the *rectal piece*, consisting of a piece more or less well marked and elevated, especially around the closed rectum.

It is principally by the leverage obtained by the hooking of the sustainers in the retaining membrane, which acts as a swinging fulcrum, that the chrysalis is prevented from falling after the cremaster is withdrawn from the larval skin. It is also principally by this same means that it is enabled to reach the silk with the cremastral hook-pad. Yet the rectal ligament plays a most important part, and in some species a more important part even, in my estimation, than the membrane itself. The tracheal ligaments which, from a study of specimens plunged in alcohol when the larval skin was about half shed, I was at first inclined to believe important auxiliaries, are, I am now satisfied, of very little if any service in most cases. The rectal ligament is a constant physiological factor, and its importance cannot be ascertained by attempts to sever the membrane at the critical moment, because in such attempts the ligament is more or less drawn out beyond the power of the sphincter muscles in the chrysalis to control it.

Dissected immediately after suspension, the sub-joint of the larva will be found to be lying, especially between the legs and around the rectum, in an abundance of translucent, membranous material. An hour or more after suspension the end of the forming chrysalis begins to separate from the larval skin, except at the tip of the cremaster. Gradually the skin of the legs and of the whole sub-joint stretches, and with the stretching the cremaster elongates, the rectal piece recedes more and more from the larval rectum, and the sustentor ridges diverge more and more from the cremaster, carrying with them, on the sustainers, a part of the soft membrane. If a larva be carefully dissected at this stage, the forming membrane may be raised with the point of a needle, and stretched so as to show its connection with the rectal ligament; or it may be lifted entirely from the retainers, when, by its elasticity, it contracts, and becomes more or less fully absorbed in the rectal ligament. It is at this stage that the strength of the latter may be fully tested, and if the chrysalis, flayed from the larval skin, and freed from the retaining membrane, be grasped in the neighbourhood of the rectum, so as to supply the natural holding power of the sphincter muscles, the rectal ligament will sustain, as I have abundantly proved, at least ten or twelve times the weight of the chrysalis; while it will support, if held by the larval skin, several times the weight of the chrysalis before separating therefrom. In brief, the retaining membrane is that part of the inner larval skin surrounding the pro-legs drawn down by the sustainers, and always intimately connected with and forming but a branch of the rectal ligament. When extended from its attachments, as when the chrysalis rises to the silk, this membrane dries, and in the cast-off larval skin retains more or less perfectly the stretched form. If the corium of the larva be thick and strong, as in *Vanessa*, the dried membrane will be broad, with two indentations where it was held by the retainers; if the corium be more delicate, as in *Danais*, *Paphia*, or *Apatura*, the dried membrane will be more forked, showing how the retainers have acted upon its elasticity. In every case, however, it shows, under the microscope, the longitudinal folds and creases incident to the stretching, and, compared to the rectal ligament proper, it seems to lose importance as it is less needed; for the *succincti* will generally attach when it is severed or loosened from the retainers, while in *Apatura* (at least as exemplified in the North American species), which combines the peculiarities of both the *succincti* and *suspensi*,[1] it does not become specialised, and the chrysalis seems to rely almost entirely on the rectal ligament, assisted by the partial holding of the delicate larval skin, not only between what is left of the sustainers and the ventral posterior margin of the twelfth joint, but between the ventral sutures of this last and the preceding joint. And here I would remark, in conclusion, that the ventral borders of two or three of the joints preceding the subjoint are, in most chrysalids which I have studied, so hardened that the larval corium is actually grasped between them and the deep sutures made in contracting. In some instances (especially in some species of *Papilio*) the posterior border of the twelfth joint is produced into a medial transverse ridge fully as prominent as that formed by the sustainers, which here are flattened and coalesce; so that the sutures of some of the terminal joints in the chrysalis do subserve the purpose ascribed to them by Réaumur, but in a somewhat different way.

[1] The larva of *Apatura* attaches horizontally, making the front pair of abdominal pro-legs answer the purpose of the girth; but in the shedding of the skin this attachment is severed, and the forming chrysalis assumes the perpendicular position, and in the withdrawal and attachment of the cremaster it acts as the true *suspensi*.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

THE Oxford *University Gazette* of October 10 contains counsel's opinions on the proposed faculty of Natural Science at Oxford. It has been proposed that the University should, by statute, establish a new faculty, under the name of "The Faculty of Natural Science," should grant degrees of Bachelor and Master in that faculty, and should give to Masters of Natural Science all the rights and privileges which are now enjoyed by Masters of Arts, so making them Members of Convocation (the governing body of the University), and enabling them to vote for the members returned to Parliament by the University. Mr. Horace Davey is of opinion that the University may create a new faculty in science, or (which comes to the same thing) may sever one of the sciences or philosophies formerly comprised in the Faculty of Arts, and may make it into a new faculty, and grant degrees therein. Such a severance was anciently made in the case of grammar, rhetoric, and music. But Mr. Davey believes that the University has no power to confer upon graduates in a new natural science faculty the rights which now belong to Masters of Arts, and the degree of Bachelor or Master of Natural Science would not make the holder a Member of Convocation. This difficulty Mr. Davey suggests, might be avoided by the University conferring the degree of Master of Arts on any person obtaining the corresponding degree in the new faculty.

The new chemical laboratories at the Oxford University Museum will be opened for students this term. The chemical department has now for many terms been overcrowded, and the new buildings will not only afford ample space for beginners and pass-men getting up their "simple salts," but contain rooms set apart for special work and fitted with the best appliances under the careful superintendence of Mr. W. W. Fisher, Aldrichean Demonstrator.

The new chemical laboratory at Balliol College will be opened this term under the superintendence of Mr. H. B. Dixon. Balliol and Trinity Colleges have combined to equip and maintain this laboratory, and a physical lecture room for the use of their own students.

At the University Museum Prof. Odling will lecture, this term, on Organic Chemistry; Mr. Fisher will lecture on Elementary Organic, and Mr. Donkin on Elementary Inorganic, Chemistry. Prof. Clifton will lecture on Elementary Electricity, and Prof. Story-Maskelyne on the Use of the Goniometer. Prof. Prestwich gives a course on two afternoons a week, on the Palæozoic Rocks, at the Museum, and Prof. Lawson will lecture on Vegetable Histology, at the Botanic Garden. Rev. C. Pritchard, Savilian Professor of Astronomy, will give practical instruction at the University Observatory, on fine evenings during the term; he will also continue giving public lectures on the history of astronomy. Dr. Rolleston will lecture on Circulation and Respiration, and practical instruction in anatomy and physiology will be carried on in the laboratory, under the superintendence of Mr. Robertson, Mr. Jackson, and Mr. Poulton. Mr. Barclay Thompson will lecture on the Anatomy of the Amphibia, at the Museum. At Christchurch Mr. Vernon Harcourt will give a course of lectures on the Elements of Chemistry, and Mr. R. E. Baynes will give a course on Mechanics.

At Magdalen College Laboratory Dr. Pike will lecture on Chemistry, and Mr. Yule and Mr. Chapman on Biology.

Exeter College has lost the valuable services of Prof. Lankester. Mr. Lewis Morgan, formerly house surgeon at the Radcliffe Infirmary, will carry on instruction in the biological laboratory of the College.

In the month of November there will be an election at Balliol College to a scholarship on the foundation of Miss Hannah Brakenbury, "For the Encouragement of the Study of Natural Science," worth 80*l.* a year (55*l.* and tuition free), tenable during residence for four years. There is no limit of age, but members of the University must not have exceeded eight terms from

matriculation. The examination will begin on Friday, November 21, at 10 A.M. Papers will be set in (1) Mechanical Philosophy and Physics; (2) Chemistry; (3) Physiology. Candidates are not expected to offer more than two of these subjects. There will be a practical examination in one or more of the above subjects.

The Science Scholarships at Exeter College have been awarded to Mr. Alfred Evans, of Aberystwith College, and Mr. Percy Morton, of Manchester Grammar School. *Proxime* Mr. Makinder. The examination was held in Biology, Chemistry, and Physics. An extra scholarship was awarded this year on account of the proficiency of the candidates.

MR. J. J. HUMMEL, who has studied at the Polytechnic School at Zurich, and in the Chemical Laboratory at the Royal Institution, Manchester, under the late Mr. Crace Calvert, and has had wide experience in the art of dyeing at some of the best establishments in the kingdom, has been appointed to the post of instructor in the recently founded School of Dyeing, at the Yorkshire College.

MR. A. J. BENTLEY, M.A., Fielden Lecturer at Owens College, has been appointed Principal of Firth College, Sheffield; we are told there were "forty applications for the post." The college is to be opened next week by Prince Leopold.

ON Wednesday last week, the Rev. J. Percival, M.A., LL.D., who, from the establishment of Clifton College, and for seventeen years, was its popular head-master, and to whose exertions the high position that College has taken among the public schools of the country is mainly due, was presented by the citizens of Bristol with a very handsome and valuable service of plate on his leaving that city for Oxford, he having been elected to the office of Principal of Trinity College, in that University.

SCIENTIFIC SERIALS

Reale Istituto Lombardo di Scienze e Lettere, Rendiconti, vol. xii. fasc. xvi.—Periodical variations of tension of atmospheric aqueous vapour and comparative humidity in the climate of Milan, deduced from thirty years' observations at the Brera Observatory, by Signor Schiaparelli.—Further studies on the pelagic fauna of the Italian lakes, by Prof. Pavesi.

THE *Rivista Scientifico Industriale* (No. 16), contains the following papers:—On the power of dry and moist air of absorbing radiant heat, by Prof. Eugenio Cicognani.—On the diffused vapour in the interior of liquids, by Prof. Giovanni Cantoni.—On the thermal and galvanometric laws of electric sparks produced by complete, incomplete, and partial discharges of condensers, by Prof. Emilio Villari.—On the discovery of nitrous acid in the presence of nitric acid, by Dr. Augusto Piccini.—On a new balance spherometer, by Prof. Domenico Surdi.

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, October 16.—M. Daubrée in the chair.—The following papers were read:—On the development of the perturbative function, &c. (continued), by M. Tisserand.—On artificial laurite and ferriferous platina, by MM. Sainte-Claire Deville and Debray. Laurite is got by heating to a bright red a mixture of ruthenium and iron pyrites. The sulphur from the pyrites combines with the ruthenium; the sulphide is dissolved in protosulphide of iron, and crystallises, on cooling, in regular octahedra, like natural laurite, or even in cubical crystals, easily separated from the iron by hydrochloric acid. A crystallised alloy of platina and iron is obtained by heating a mixture of platina and pyrites with borax, and treating with certain acids and potash.—Studies on the effects and the mode of action of substances employed in antiseptic dressings, by MM. Gosselin and Bergeron. The imputrescence of 1 gr. of blood is secured by a dose of 0·010 gr. to 0·015 gr. of carbolic acid; with smaller doses the putrefaction is retarded, but not prevented (at least if the dose be not gradually increased). As to the mode of action, the authors consider it is not exclusively by destruction of atmospheric germs (as Lister represents), but by the contact of the antiseptic producing coagulation of albumen. What the authors call the antiseptic alteration of the blood (by addition of a considerable proportion of carbolic acid or alcohol) consists (1) in thickening and yellowing (to the naked eye), and (2) in replacement of the globules by granular masses. This very rapidly-produced imputrescence could not be realised in wounds, the dose of antiseptic being too large; one can merely retard or diminish the putridity, and hope the blood will be absorbed before being altered in septicæmic degree.—On a sporadosideric meteorite that fell on January 31, 1879, at Becasse, Commune of Dun-le-Poelier (Indre), by M. Daubrée. The detonation was heard (about midday) at 20 km. distance. A sound as of a distant train preceded it, and it was followed by rumbling as of thunder. The meteorite (only one) was dug out from about 0·30 m. depth; it must have reached the ground almost vertically, while its trajectory seems to have been from south-south-east to north-north-west. It weighed 2·800 kg., and its form was roughly that of a pyramid with quadrangular base. It seemed to be chiefly formed of peridot and bisilicates (such as pyroxene or enstatite). The metallic grains consisted of nickelised iron, accompanied by tröilite. It belongs to the sub-group of oligosideres in the sporadosideric group.—On the mathematical theory of changes of brightness of double stars, by M. Gyldén.—The mildew, or false American oidium in the vineyards of France, by M. Planchon.—Extract of a letter to M. D'Abbadie, on the operations for junction of the triangulation of Algeria to that of Spain, by M. Perrier. These have been quite successful, and the meridian of France is now extended to the Sahara. The electric light was used in signalling.—On the synthesis of diphenylpropane, and on a new mode of formation of dibenzyl, by M. Silva.—Reaction of the cyanamide with the chlorhydrate of dimethylamine, by M. Tatarinoff.—On the cleistogamic state of *Pavonia hastata*, Cav., by M. Heckel. Physiologists who, like Pontedera and M. Bonnier, represent the *rôle* of nectaries to be that of organs of nutrition of embryos, have to give account of the fact that in the same cleistogamous plant, the close flowers, without nectar, are as fertile as the perfect flowers, sometimes more so, and sometimes fertile to the exclusion of these others.—Upper sands of Pierrefitte, near Etampes, by M. Meunier. He calls attention to some new species of molluscs represented there.—On the mineral associations contained in certain trachytes of the ravine of Riveau-Grand, in Mont Doré, by M. Gounard.—M. Chasles presented the first part of a memoir on the history of geodesy in Italy from the most ancient times to the middle of the nineteenth century, by Prof. Riccardi.—M. Larrey presented an English work by Mr. Longmore, on wounds by fire-arms.

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